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1815

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JAMES ROBB CHURCH

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THE
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ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

TYPHOID MARY

BY MAJOR GEORGE A. SOPER
Sanitary Corps, United States Army

INTRODUCTORY NOTE BY THE SURGEON GENERAL OF THE ARMY

The appearance of the following article in THE MILITARY SURGEON has a particular appropriateness in spite of the fact that the history of this remarkable woman has been confined, so far as known, to persons in civil life. It is appropriate for a number of reasons.

First, the story, substantially as it appears on these pages, formed an address which Major Soper delivered before the Surgeons of the Sixth Division to which he was attached as epidemiologist in the Army in 1918.

Second, typhoid has been brought under control largely by reason of work done to prevent the very kind of infection which "Typhoid Mary" produced. Investigation showed that a large part of the typhoid in the Spanish American War was due to contact, and the preventive treatment by inoculation which has been compulsory among United States troops since 1911 has been particularly directed against this method of transmission. And in the present war the disease has been combatted not only by attention to sanitation and inoculation, but by examining cooks and other food handlers for the carrier state in order that no person such as "Typhoid Mary" might be allowed to spread infectious material even among those who were immunized against it.

Since "Typhoid Mary" was discovered, the whole problem of carriers in relation to infectious diseases has assumed an immense importance, an importance which is recognized in every country where effective public health work is done and in every army where communicable disease has been brought under control.

The literature of typhoid now contains many examples of the carrier state such as "Typhoid Mary" exhibited; there have been some carriers who have produced more cases, but it is safe to say that it has fallen to the lot of no person to give by example a more striking lesson of the need of personal precautions in the control of disease than has been afforded by this remarkable woman. Her interesting history contains lessons which should be carefully heeded by everybody, whether in the Army or out of it.

M. W. IRELAND,
Surgeon General, U. S. Army.

THIS is the story of the cook who produced a series of epidemics of typhoid fever and was finally discovered and locked up by the New York City Department of Health. Her general history up to that

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point is widely known, although few details of it can be given by most persons. Her history after her arrest forms a fitting climax to her career.

How she disappeared, produced more typhoid and was caught again, is now set down for the first time.

The great amount of attention which the case has received is due entirely to the natural interest which it possesses. The case has never been exploited for the dramatic elements which it contains, although these fairly crowd one another throughout the narrative. The circumstances of Typhoid Mary's discovery were simply announced before the Biological Society of Washington, D. C., April 6, 1907, in a brief paper. This paper subsequently appeared in a medical journal.[1] Since then no authoritative account of the case has been written. Most of the knowledge which the world possesses of it has been obtained from newspaper accounts of some of Mary's interesting movements since her original arrest.

Many inquiries have been received by me as to the history of Typhoid Mary since her first arrest, and although I have had no official connection with the matter since I brought the details to the attention of the New York City Department of Health on March 11, 1907, I seem to be regarded as the person to whom all such inquiries should be addressed.

It is in view of the scientific and popular interest in the subject which has continued now for more than a dozen years, that the following notes are made, the intention being to review the essential facts and to give notice to Typhoid Mary's movements since she was first taken into custody by the New York City Department of Health.

HER DISCOVERY

In the winter of 1906 I was called upon by Mr. George Thompson, of New York City, to investigate a household epidemic which had broken out in the latter part of the preceding August at the Thompson country place at Oyster Bay. The epidemic had been studied by experts immediately after it took place, and there were a number of typewritten reports upon it, but its cause had not positively been ascertained. It was thought by the owner that, unless the mystery surrounding the outbreak could be satisfactorily cleared up, it would be impossible to find desirable tenants for the property during the coming season.

The essential facts concerning the investigation follow:

Six persons in a household of eleven were attacked with typhoid

[1] The Work of a Chronic Typhoid Germ Distributor, George A. Soper, Ph.D. Jour. Am. Med. Assn., June 15, 1907, Vol. xlvii, pp. 2019-2022.

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fever. The house was large, surrounded with ample grounds, in a desirable part of the village, among other handsome places, and had been rented for the summer by a New York banker, Mr. Charles Henry Warren.

The first person to be taken sick fell ill on August 27, and the last on September 3. The diagnosis was positive. Two of the patients were sent to the Nassau Hospital at Mineola, and the others were attended by capable physicians at Oyster Bay. None of the subsequent cases apparently resulted from the first. They seemed all to have been original infections. But, whether the disease was transmitted locally or not, the point of interest lay in the origin of the first case.

Typhoid was an unusual disease in Oyster Bay. At the time of the outbreak no other case was known. None followed.

The milk supply, cream, water and other articles of food which might have been implicated were one by one carefully eliminated as possible causes. The drainage was examined and found satisfactory. Extreme care was used in this part of the investigation in view of the fact that there was a firmly settled belief on the part of many persons that the water had become contaminated from cesspools, a privy vault or stable manure pit. Analyses of the water were made independently by two competent chemists and flourescein was used to study the possibilities of underground percolation. As a result of this particular study it did not seem to me that the water theory was tenable.

I was led from the proper track for a time by being informed that the family was extremely fond of soft clams and that supplies of these shell fish had frequently been obtained from an Indian woman who lived in a tent on the beach, not far from the house, and whose supplies of clams were sometimes taken from places that were not improbably polluted with sewage.

But if clams had been responsible for the outbreak, it did not seem clear why the fever should have been confined to this house, because soft clams formed a common article of diet among the native inhabitants of Oyster Bay. On inquiring closely, it was found that no clams had been eaten for six weeks before the outbreak of typhoid, and six weeks was too long a period for an epidemic of this character to remain undeveloped. In my opinion the infectious matter which produced the epidemic had been taken with food or drink on, or before, August 20.

The history of the house with regard to typhoid showed that no case had occurred on the premises or been nursed there, nor was it believed that a convalescent had visited it in thirteen years, and the house had been occupied every summer since then.

Attention was then concentrated on the first case of typhoid to determine whether the infection could have occurred during a temporary absence from Oyster Bay, and it was discovered that no person

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who was taken sick had been on a visit away from Oyster Bay for several weeks prior to the onset of the disease.

The social positions of the persons attacked differed decidedly. The first was a daughter of the family; the next two were maid-servants. Following this, in quick succession, were the wife, and then another daughter of the tenant, and finally a gardener who resided permanently at Oyster Bay and who had lived on the place for years.

Believing that some event had occurred in the family or in Oyster Bay, which, properly studied, might give the clue to the cause of the epidemic, the immediate history of the household at this time was carefully inquired into. This gave the key to the situation.

It was found that the family had changed cooks on August 4, about three weeks before the epidemic broke out. Little was known about the new cook's history. She had been engaged at an employment bureau which gave her a good recommendation. She remained in the family only a short time,leaving about three weeks after the outbreak of typhoid occurred. Her present whereabouts were unknown.

The cook was described as an Irish woman about forty years of age, intelligent, tall, heavy, single and non-communicative. She seemed to be in perfect health. She was not known ever to have had an attack of typhoid.

Here was by all means the most important clue which had come to my notice. If this woman could be found and questioned, it seemed likely that she could give facts from which the cause of the epidemic could be ascertained. I had seen typhoid spread in large epidemics under circumstances which led me to believe that it should be regarded as a contagious disease, and I had so dealt with it when acting as expert for the State of New York in handling the epidemic of 1,300 cases at Ithaca in 1903,[2] and later as expert of the city of Watertown, N. Y., in fighting an epidemic of 600 cases in 1904.[3]

When, after much difficulty, the cook was found, no information of value was obtainable from her. She refused to speak to me or to anyone about herself or her history, except on matters which she found were already known.

Her former employers gave freely what information they could, but their minds were not wholly free from bias. Nearly all the epidemics which I was inquiring into had been investigated soon after they occurred and had been explained in a different way. The answers to my questions were therefore unconsciously framed so as to convince me that the original explanations were correct.

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[2]The Epidemic of Typhoid Fever at Ithaca, N. Y., by George A. Soper. Jour. of the New England Water Works Association, Vol. xviii, pages 431-461, 1904.

[3]The Management of the Typhoid Fever Epidemic at Watertown, New York, in 1904, by George A. Soper. Jour. of the New England Water Works Association, Vol. xxii, No. 2, pages 87-163, 1905.

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Curiously enough the greatest help came from a quarter which was least expected. The office through which Mary had secured some of her situations gave me all the assistance which it possessed. This office, conducted in the name of a woman, was really run by a man. For some good reason he did not allow his own name to be known. Whether by aptitude, training, or both, this person possessed many of the attributes of a good investigator. Without his help Typhoid Mary could not have been found.

In passing, it is interesting to observe that nobody who hired Mary seems to have inquired personally into her references. It seems that the names of some of her former employers were available, but it appears not to be the custom of the patrons of fashionable employment bureaus to inquire deeply into the personal history of the servants. Mary always was accepted on the recommendation of the proprietor. He was trusted to run a genuine intelligence bureau and it is but right to say that, on the whole, he discharged his obligations admirably.

The effort to work out Typhoid Mary's history was only partly successful. There were many false clews and puzzling circumstances. The mystery which had at first surrounded her continued and was often completely baffling. Sometimes it was somebody's memory which was at fault—few housekeepers seem to know anything about their cooks, much less recall the food which they have eaten weeks and months ago. Yet this information, in some instances, was indispensable.

Sometimes it appeared that persons were deliberately refusing to tell what they knew. Twice, I think, I talked with members of Mary's family, but I could never be sure of it. Servants who had been associated with her never gave any help.

Try as I would, Typhoid Mary's whereabouts for only parts of the ten years before the Oyster Bay outbreak could be determined with unmistakable certainty. About two years of the preceding five remained unaccounted for. In ten years she is known to have worked for eight families and in seven of these typhoid had occurred. She had always escaped in the epidemics with which she had been connected.

A summary of the principal epidemics follows:

In 1904 there was an outbreak at the summer residence of Henry Gilsey, Esq., at Sands Point, N. Y. The household consisted of eleven persons, seven of whom were servants. The house was rented on June 1. On June 8 typhoid began to appear. The first case was that of a laundress. Following this three other persons were taken sick in succession. None of the family was attacked. The Sands Point epidemic was confined to the house where the servants lived. There were no other cases before or after, either in the household or in the village. The cause of the outbreak was believed to be connected in some way with the servants' quarters.

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In 1902 a severe outbreak occurred in the family of a New York lawyer at Dark Harbor, Maine. Mr. Coleman Drayton had rented a cottage for the summer and just before leaving New York to occupy it with his family had engaged Mary Mallon to act as cook. Seven members of this household of nine were presently attacked. In addition, a trained nurse who came in by the day took sick. The first case occurred two weeks after the arrival, on June 17. One week later another case occurred; two days later there was a third; the remainder followed rapidly. The only persons who escaped were the cook and Mr. Drayton himself, and he had had an attack some years before. These two faced together the burden and anxiety as, one by one, every other occupant of the house fell ill. Mr. Drayton felt so grateful to the cook for the help which she gave him during the epidemic that at the end of the epidemic he made her a handsome present of money in addition to her wages, little thinking that the cause of the whole trouble lay at her door.

The Dark Harbor epidemic was investigated at the time and a written report was made upon it. The infection was thought to have been brought to the house by the maid-servant who was the first to be taken ill. It seems that the servants had access to a water tank in the top of the house and it was supposed that this tank became polluted by the first person who was attacked, thus infecting the entire household. How the original case was produced was not explained, but it was assumed with the easy logic which is familiar in many such investigations that it was contracted elsewhere.

Mary Mallon's history before she went to Dark Harbor is not clear. In 1901–02 she lived about eleven months with one family. Here a laundress was taken ill and removed to the Roosevelt Hospital, December 9, 1901. This attack occurred one month after the cook's arrival. Unlike the other outbreaks, the cause of this attack was not investigated at the time, and full information concerning it has not been available.

My earliest record of Mary Mallon's employment is in a New York family which had a summer residence at Mamaroneck, New York. In this instance a young man who made a visit to the family was attacked, his illness dating from September 4, 1904. The cook left a few days after the onset of this illness. It is interesting to observe that she had been in the family for three years without apparently being connected in any way with typhoid before this. It was believed at the time that the young man had contracted his typhoid before he came to visit the family.

Subsequent to her employment at Oyster Bay, Mary Mallon went to live with a family at Tuxedo, New York. She remained about one month—to be exact, from September 21 to October 27, 1906. On October 5, fourteen days after her arrival, a laundress was taken sick with

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typhoid fever and removed to St. Joseph's Hospital, Patterson. No other case had been known in Tuxedo for several years.

HER ARREST AND EXAMINATION

When at last the cook's final whereabouts were ascertained, it was discovered that two cases of typhoid had recently broken out in the household where she was employed. These occurred a few weeks after her arrival. One patient, a chambermaid, was taken sick January 23, 1907, and removed to the Presbyterian Hospital. The doctor was first called to see the other patient, a daughter of the owner of the house, on February 8. This second case resulted fatally on February 23, 1907, the only fatal case in the record up to this time. A period of two months elapsed between the beginning of the employment of the cook and the first case. There was some doubt about the diagnosis of these cases at the time of my investigation and no opinion had been formed as to their origin. The cook was about to leave the New York house.

It was at this house that I had my first interview with Mary. I expected to find a person who would be as desirous as I was for an explanation of the way in which the typhoid had followed her. Certainly she could not have failed to be impressed by the strange fatality with which the disease had broken out wherever she went. It must have looked as though it was pursuing her. Could she be connected with it in any way? Possibly she had even thought that she had produced the epidemics.

If she were implicated in the outbreaks it was, of course, innocently. I supposed that she would be glad to know the truth and to be shown how to take such precautions as would protect those about her against infection. I thought I could count upon her coöperation in clearing up some of the mystery which surrounded her past. I hoped that we might work out together the complete history of the case and make suitable plans for the protection of her associates in the future. Science and humanitarian considerations made it necessary to clear up the whole matter.

My interview was short. It started in the kitchen and ended almost immediately at the basement door. Reason, at least in the forms in which I was acquainted with it, proved unavailing. My point of view was not acceptable and the claims of science and humanity were unavailing. I never felt more helpless.

The next interview was staged more deliberately. Mary had a friend whom she often visited at night in the top of a Third Avenue tenement. He kindly offered to manage for the meeting and one night, after her work was done, I awaited her with a physician, Dr. Bert Raymond Hoobler, one of my former assistants, whom I had called on to help. We waited at the head of the stairs in the Third Avenue house.

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At length Mary Mallon came. Dr. Hoobler and I described the situation with as much tact and judgment as we possessed. We explained our suspicions. We pointed out the need of examinations which might reveal the source of the infectious matter which Mary was, to a practical certainty, producing. We wanted a small sample of urine, one of feces and one of blood. The urine and feces were to be tested for typhoid bacilli and the blood for the Widal reaction. We hoped we could get some information from Mary at the same time.

Indignant and peremptory denials met our appeals. We were unable to make any headway. Mary's position was like that of the lawyer who, on being told by the judge that the facts were all against his client, said that he proposed to deny the facts. Mary denied that she was a carrier. She referred to the Dark Harbor outbreak for proof of her helpfulness and to the gift from her employer there as testimony of the same. Far from causing typhoid, she had helped to cure it. Nothing could alter her position. As Mary's attitude toward us at this point could in no sense be interpreted as cordial, we were glad to close the interview and get down to the street. We concluded that it would be hopeless to try again.

Here my investigation came to an end. It was evident that, although I had succeeded in collecting only fragments of her history, there was a remarkable resemblance between these parts. In each instance one or more cases of typhoid had occurred in households after the cook had arrived, or among people who had come to live near her and eaten of the food which she prepared. In every instance the families had ample means and lived well, as the saying is.

The bearing which wealth may have on the chance of infection may not at once be apparent, but it was taken carefully into account in this investigation. People who live as did the families concerned in these epidemics are almost isolated from infection by their cooks by reason of the fact that nearly everything they eat is subjected to the heat of cooking after it leaves the cook's hands. The heat kills the germs The cook does not cut the bread or arrange the salad or fruit, for example. All such work is done by a butler, footman or waitress, depending upon the manner in which the housework is organized. The cook comes in much more direct contact with the cooked food of the servants; a fact which probably accounts for the relatively larger number of servants attacked in the several epidemics.

Each household had consisted of four or five in the family and from five to seven servants. Four of those attacked had been laundresses, and two gardeners permanently attached to the country places where the epidemics had broken out. All but two of the outbreaks had occurred in the country. The cook had escaped sickness in every instance. In only one case could I find that she had worked in a family where no

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typhoid occurred, and as this family consisted only of three people of advanced age it is not improbable that they were immune. In all, there were twenty-six cases and one death; twenty-four of these cases had occurred in the preceding five years.

Believing that enough had been learned to show that the cook was a competent cause of typhoid, I laid the facts concerning the four principal epidemics before Dr. Herman M. Briggs, Medical Officer of Health of the New York City Department of Health, with the suggestion that the woman be taken into custody by the department and her excretions made the subject of careful bacteriological examination. I had been unable to obtain her consent to any examination whatever.

The department acted favorably on this suggestion and, after considerable difficulty, during which a number of officers had to be called upon to help, the cook was removed to the Detention Hospital of the Health Department. She reached there on March 19, 1907. She was placed in charge of Dr. Robert J. Wilson, Superintendent of the Department of Hospitals, and Dr. William H. Park, Chief of the Research Laboratories of the Department of Health. Dr. M. Goodwin did the bacteriological work under Dr. Park's direction.

My third and last attempt at an interview was after her arrest. Mary was in a separate room at the Detention Hospital. I explained that I had come to get some information from her. It was desirable to know whether she had ever had an attack of typhoid and, if so, where and when. Would she consent to give a complete history of her experience with typhoid? The information might help many. It could not possibly hurt her. It might prove very helpful in explaining her case. As matters stood, nobody accused her of deliberately intending any harm. If possible, she was to be freed from her disease-producing capacity.

This interview was shorter than the other two. Without uttering a word Mary retreated with dignity to the toilet, leaving me standing alone in the room.

It was expected by me that the germs might be found in the urine, but more probably in the stools. None was found in the urine. The stools contained the germs in great numbers. Daily examinations made for over two weeks failed only twice to reveal the presence of the *Bacillus typhosus*, and on these occasions the sample taken was perhaps too small to reveal them. The blood gave a positive Widal reaction. The cook appeared to be in perfect health.

The feces were examined on an average of three times a week from March 20 to November 16, 1907, and in only a comparatively few instances did the investigators fail to find the bacilli. During the summer months the culture plates contained only a few typhoid-like colonies. In July there were five consecutive negative tests followed by a positive one.

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During August the stools showed no typhoid; in September they began to appear again; from September 11 to October 14, 1907, the feces failed to yield typhoid bacilli. During this time the patient's diet was carefully regulated and she was receiving mild laxatives. On October 16, 1907, a very thorough test showed that the germs were again present. From October 16, 1907, to February 5, 1908, weekly examinations of the stools gave, with only two exceptions, from 25 to 50 per cent typhoid-like colonies on the culture plates. These exceptions were on November 13 and December 4, when no typhoid was found.

The implication was plain. The cook was virtually a living culture tube in which the germs of typhoid multiplied and from which they escaped in the movements from her bowels. When at toilet her hands became soiled, perhaps unconsciously and invisibly so. When she prepared a meal, the germs were washed and rubbed from her fingers into the food. No housekeeper ever gave me to understand that Mary was a particularly clean cook.

In the Oyster Bay outbreak, which was studied with more particularity than the others, the infectious matter is believed to have been carried from the cook's hands to the people who were later taken sick by means of ice cream containing cut-up peaches. Mary prepared this herself. In this instance no heat sterilized the washings from her hands.

Mary Mallon was kept virtually a prisoner by the Department of Health for three years. At first she was held at the hospital for contagious diseases at the foot of East 16th Street, Manhattan; later she was removed to Riverside Hospital on North Brother's Island in the East River, between Hell Gate and Long Island Sound. She was employed in various ways, sometimes as laundress. She was allowed to receive friends and enjoyed such privileges as were possible, but she never became reconciled to her detention.

Two legal actions were brought to secure her release. The claims made on her behalf were that she was being deprived of her liberty without ever having committed a crime or knowingly having done injury to any persons or property; she was held without being given a hearing; she was apparently under life sentence; it was contrary to the Constitution of the United States to hold her under the circumstances; such action on the part of the authorities was without precedent. These legal actions were argued with much ability. It was expected that, if she won, she would recover heavy damages.

The case attracted a great deal of public notice, some of the newspapers going to the extent of printing the arguments with illustrations of the unfortunate woman. The courts held that the Department of Health acted within its rights in keeping Mary Mallon in custody and that they were well serving the public interests in refusing to release her.

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Public sentiment, to judge by the illustrations, was a trifle mixed. On the one hand Mary was pictured as frying deadly typhoid bacilli the size of sausages in preparation for the family meal, and on the other she was shown sitting lone and dejected on her island with a mongrel dog as her solitary companion. *Punch*, the famous English funny paper, devoted a column of poetry to the case.

HER DISAPPEARANCE AND REDISCOVERY

Although the courts refused to order her release, there was a good deal of sympathy for Typhoid Mary. Whatever could be said of the consequences of her cooking, she had been an innocent offender. She was careless in her personal habits, but so are most cooks. If she was a deadly germ producer, so were thousands of others who were enjoying their liberty. To many persons who did not know Mary it seemed that she ought to be given her liberty.

In the year 1910, soon after a change was made in the administrative head of the Department of Health, Mary Mallon was voluntarily released on her promise not to take employment as a cook nor engage in an occupation which would bring her in contact with food. It was thought that she had learned in three years how dangerous she was and how to avoid infecting people. She was forbidden to cook or otherwise handle the food of others and was required to report periodically to the Department of Health.

For awhile she kept her promise. Then she broke her parole and disappeared. She was lost sight of for nearly five years. I have been unable to learn her complete history during this period, but from the fragments which have been collected, it is apparent that she continued to enact her fateful rôle of typhoid producer. Due to the fact that the woman assumed various names and left little trace behind to indicate her whereabouts, it was not possible to learn all that was desired.

She seems to have produced two cases of typhoid in a sanatorium at New Foundland, N. J., where she was employed in 1914, and another case in New York City in the same year in a small family where she was living under an assumed name with a friend. This, however, is anticipating the end of the story.

Mary Mallon came to light for the second time under circumstances which were the most dramatic of her entire career.

In January and February, 1915, an outbreak of typhoid occurred in the Sloane Hospital for Women on West 59th Street, New York City. In this epidemic there were twenty-five cases; they were mostly among the nurses and other attendants of the institution. The Sloane Hospital is one of the most capably managed institutions of its kind in America, and in its attention to every sanitary requirement is intended to be a model for the teaching of students in the College of Physicians and

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Surgeons of which it is practically a part. In his conduct of the hospital and in his lectures to his students, it was the custom of Dr. Edwin B. Cragin, Attending Obstetrician and Gynecologist, to lay his main emphasis upon scrupulous care of the hands. Yet, as Dr. Cragin freely acknowledged, this outbreak was produced by a woman whose hands became soiled with her excrement and who through careless and dirty habits infected the food of the inmates of the institution. Whether she at first used sufficient care and later became indifferent is not known, but it is an interesting fact that Mary worked as cook in the hospital for about three months before the first case occurred.

She knew, of course, the danger and how to avoid it. She knew that she was violating her agreement with the Department of Health in engaging in the occupation of cook. That she took chances both with the lives of other people and with her own prospect for liberty and that she did this deliberately and in a hospital where the risk of detection and severe punishment were particularly great, argues a mental attitude which is difficult to explain. Aside from such behavior as this, Mary Mallon appears to be an unusually intelligent woman. She writes an excellent hand, and the composition of her letters leaves little room for criticism.

She possesses enough skill as a cook to command high wages and has been able to obtain work in the most desirable situations. Surely a mysterious, non-communicative, self-reliant, abundantly courageous person; a character apart, by nature and by circumstance, strangely chosen to bear the burden of a great lesson to the world. If she had learned and been willing to practice what she learned, she would not have had this costly lesson to teach.

Mary Mallon was officially known in the hospital by the name of Mrs. Brown, but she was jokingly nicknamed "Typhoid Mary" by her fellow-servants when the epidemic occurred, for there were some who remembered the published accounts of Mary Mallon's unfortunate experience of years ago. It was this nickname, applied in jest, that led the authorities to find her out.

When genuine suspicion began to focus upon her, Mary cleverly disappeared. Before she could be apprehended, she moved to New Jersey and then to a home in Long Island. She was finally traced to the Long Island house and was forcibly removed to the Riverside Hospital of the New York City Department of Health, refusing to go there without compulsion. She has been held by the Department of Health to June, 1919, without any prospect of again being released.

HER LESSON TO CIVILIZATION

Mary's status after her second arrest has been totally different from that which she possessed after her first. This is true both as to the legal

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aspects and public sympathy. Whatever rights she once possessed as the innocent victim of an infected condition, precisely like that of hundreds of others who were free, were now lost. She was now a woman who could not claim innocence. She was known wilfully and deliberately to have taken desperate chances with human life, and this against the specific instructions of the Health Department. She had been treated fairly; she had been given her liberty and was out on parole. She had abused her privilege; she had broken her parole. She was a dangerous character and must be treated accordingly.

The total number of outbreaks of which Typhoid Mary is known to be the cause is ten; the total number of cases, fifty-one. Owing to the fact that only parts of her entire history are known, it is probable that the total number of outbreaks for which she is responsible is much larger than this record indicates. It would surprise nobody to learn that she had produced some extensive epidemics.

The case of Mary Mallon is of exceptional interest for a number of reasons. For one thing it illustrates one of the ways in which typhoid and other diseases may be spread without the real cause being suspected. It also shows that we should be slow in arriving at an opinion as to the origin of an outbreak.

It shows how carefully we should select our cooks, and it calls attention in a startling manner to the fact that we ordinarily know very little about them. It confirms the truth of the adage that the more we pay the less we know about our servants.

The Mallon case affords a striking proof of the fact that our food is not infrequently contaminated by excrement. Here lies, perhaps, a common source of infection. Possibly many of the so-called diarrheas and food poisonings which occur may be ascribed to this cause. Some persons and some families seem to be especially prone to these upsets. Is it not possible that what appears to be special susceptibility is really infection from a nearby carrier in many of these instances?

The story of Typhoid Mary indicates how difficult it is to teach infected people to guard against infecting others. Mary had ample opportunity to know the danger which she constituted toward those whose food she prepared. She knew from being told and she knew by experience. She was aware of the penalty which she would suffer if she broke her parole and caused another outbreak. That she could have avoided spreading infection by obeying her instructions admits of no doubt. She knew that when she cooked she killed people, and yet she deliberately sought employment as a cook in a hospital. Why did she do this?

The case is least remarkable for the reason that it was the first of its kind to be worked out in America. It is surprising that nobody had discovered a carrier before. They are now known to be rather common.

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Somewhat similar investigations had been made in Germany, and I make no claim of originality or for any other credit in her discovery. My interest and experience in the epidemiology of typhoid had been of long standing. I had read the address which Koch had delivered before the Kaiser Wilhelm's Akademie, November 28, 1902, and his investigation into the prevalence of typhoid at Trier,[3] and thought it was one of the most illuminating of documents. In fact it had been the basis of much of the epidemic work with which I had been connected.

Koch's address was not the only one printed about this time to show that healthy carriers might exist and give rise to typhoid. Conradi and Drigalski[4] had anticipated Koch and it was probably on the suggestion contained in their paper to the effect that with their new culture medium they had found typhoid bacilli in the stools of several well persons that Koch's flying laboratory was sent to Trier and the ground prepared for his Kaiser Wilhelm's Akademic address.

In the Festschrift Zum Sechzigsten Geburstag von Robert Koch, which appeared in 1903, there are several papers on the probable rôle of healthy carriers in producing typhoid. About this time Kayser, Klinger and others were publishing in Arbeiten aus dem Kaiserlichen Gesundheitsamte reports of cases which they found to be due to persons whose condition was much like Typhoid Mary's. Dr. Simon Flexner kindly called my attention to some of these references after I had concluded my work on the Mary Mallon case.

The literature of carriers has enormously increased in all countries since 1906. Instances of carriers causing large and small epidemics have multiplied by the score. The extent of the danger which is to be apprehended from this source and the steps to be taken to meet it have been discussed pro and con until it would seem that the grounds for a common agreement must long since have been reached.

There is agreement as to nearly everything except how to cure the carrier condition. In some cases the germ focus can be reached and removed, in other cases this has so far proved impossible. The trend of thought has entirely changed as to the cause of typhoid fever. Before the rôle of carriers was suspected, water supplies and milk were considered the principal means of transmission. The carrier idea led many to think that here was the principal explanation of the spread of typhoid.

The present thought is that carriers account for a varying proportion of the total typhoid in a region, the exact figure depending largely upon local circumstances. Where water supplies, milk and other common

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[3] Die Bekampfung des Typhus—Veroffentlichungen aus dem Gebiete des Militar-Sanitatswessens, 21 Berlin, 1903.

[4] Zeitschr. f. Hyg. und Infect. 39, 1902, pp. 281–300.

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vehicles of typhoid can be satisfactorily excluded from the reckoning, carriers probably account for most of the cases.

As a result of research work done in Europe and America, it has been found that from 2 to 3 per cent of all persons who have typhoid fever become chronic germ producers. Carriers have been divided into many classes and groups: some are intermittent, others continuous. A certain proportion permanently free themselves from infection and consequently their power to produce typhoid. Others never become free.

It has thus far been feasible to cure some of the carriers of their unfortunate condition, but there are others who cannot be cured. Experiments at disinfection and even the removal of the gall-bladder, which is generally the focus of the bacteria, have sometimes failed to produce the desired result.

What is to be done in order to protect ourselves from the danger of typhoid carriers? First, it is desirable to discover the carriers. This is not easy. It is most readily done with the help of a good laboratory. The examination of the feces should be made over and over again. Second, carriers must be told of their condition. They must be taught to use precautions against soiling the hands with the excretions. They must be taught to wash their hands frequently: always after leaving the toilet and always before handling food; they must never handle the food of others and they must try to give up the senseless habit of shaking hands.

We should all be careful to avoid eating uncooked food which has come in contact with the hands of persons whose history is not known to us and who may have contaminated the food immediately before our getting it.

Those of us who have had typhoid fever should be examined to determine whether we are carriers. If we are carriers, our families should be inoculated against the particular strain of the typhoid germ which infects us and special precautions should be exercised against the transmission of the bacilli in the household.

DETAILED NOTICE OF THE OCTOBER MEETING AT ST. LOUIS, MISSOURI, WILL APPEAR IN AN EARLY ISSUE.

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RESECTION OF HEAD OF FEMUR IN CERTAIN GUNSHOT WOUNDS OF THE HIP REGION

(Report of Two Cases)

By Major ROBERT B. PRATT and Captain JOHN F. PARK
Medical Corps, United States Army

THE surgery of the hip joint, including as it does the head of the femur, the upper fifth of the femur, the neighboring pelvic bones, the pelvic contents, and the great mass of musculo-tendinous and fascial tissues in this area, is as replete with serious and complicated problems as any approachable region of the body.

Two cases of serious gunshot wounds of the hip, both involving the head of the femur and acetabulum, have come to our attention, have been closely parallel in their courses, complications and indications for treatment, and in our opinion constitute valuable contributions in support of the surgical principles to be considered in all cases of pyogenic infections of this joint.

Case I. J. F. C., No. 3175171, Private, Co. D, 16th Inf. White; 21 years old. History negative previous to wound.

October 8, 1918: Sustained, in action, severe, multiple, penetrating gunshot wounds (shrapnel) of left abdomen, left hip and left foot.

October 13, 1918: Debridement and secondary closure at an evacuation hospital.

December 17, 1918: A little over two months after injury he was admitted to U. S. A. Base Hospital No. 216. His general condition was serious. There were emaciation, pallor and flushed cheeks, relaxed skin, persistently large pupils, dry, red tongue, prostration, despondence, anorexia, insomnia, septic type of temperature, and pulse ranging from 110 to 120; respiration normal; heart and lungs negative. The abdominal wound was healed and the intraperitoneal state was apparently negative. The right hip and right lower extremity, genitalia and ano-rectal region were negative. A sacral bed-sore, about three inches in diameter, and a pressure ulcer from Thomas splint, over left ischial spine, were present.

Left hip and left lower extremity: A Thomas splint was in position, but was ineffective owing to the ischial sore. There were multiple sinuses about the hip, bordered with edematous, unhealthy scar tissue, and exuding large amounts of pus containing non-hemolytic streptococci and staphylococci; no anaerobic organisms. There was wasting of the buttock and atrophy of the entire limb. The skin was in poor condition from continued adhesive traction dressing. There was a superficial healing wound over outer side of leg.

X-ray examination showed a compound, comminuted fracture of the head of the femur and acetabulum, with infectious destructive process, and with new bone formation, not only at the joint, but in the muscle mass some distance away. Some atrophy of femoral shaft.

Urine examination and blood culture negative.

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Blood count showed only moderate leucocytosis.

An attempt was made to lessen the infection about the hip by use of Dakin's fluid; to improve the sacral decubitus by half-turning him on to his right side; to improve his general condition by full feeding, iron, etc.; but without any notable result.

Operation.—January 17, 1919. Ether. Citrated blood transfusion (600 c.c.) during operation. Excision of one scar with its sinus, running from behind the anterior superior spine toward the great trochanter, this incision being continued to three inches below the great trochanter. Tissues freed about the entire circumference of the femoral shaft, just below the lesser trochanter. Gigli saw passed, and shaft sawed through at this point. Largest fragment grasped with iron-jawed forceps, cleared along its posterior border to the acetabulum, entirely freed, and removed. Two other fragmented portions of head and neck removed. Slight necrosis of acetabulum was found. This was thoroughly curetted away, to establish drainage from its inner surface. Medulla of upper end of shaft was abnormal but not purulent. It was curetted out for about one inch. Slight hemorrhage was controlled chiefly by packing, only one vessel requiring ligature. Time of operation and ether, twenty minutes. On account of sacral and ischial ulcers it was not thought advisable to attempt fixation by other means than sandbags.

Tetanus antitoxin (1,500 units) was given the day of and on the sixth and twelfth days after operation.

Pathological Report.—Microscopical description: Specimens consist of three pieces of bone tissue. No. 1 consists of head and portion of neck of femur. The head shows extensive necrosis of bone and almost complete absence of articular cartilage. The neck is fractured obliquely, and one portion attached to head. No. 2 consists of the great trochanter and external half of the shaft of femur as far as and including the lesser trochanter. This fragment shows exuberant callus formation. The medulla is soft, reddish-brown and semipultaceous. No. 3 consists of portion of inner half of shaft of femur and portion of attached neck.

Microscopical findings: (1) Section taken through head of femur. The articular surface shows some erosion and super-proliferation of young cartilaginous tissue. Diagnosis—healing arthritis. The cancellous portion of the head shows chronic inflammation. (2) Sections taken through the shaft near the lesser trochanter show acute inflammatory reaction. Diagnosis—acute osteomyelitis.

Progress.—His condition during the first night was very poor, and it is reasonable to believe that he would not have survived the operation in the absence of transfusion. General improvement began in a few days. Carrel-Dakin treatment was instituted on the fourth day after operation. On February 4, 1919, his pressure ulcers were healed and fixation of trunk and both lower extremities (the left in abduction) was gained by plaster cast. From then on his progress was very rapid. The right lower extremity was freed from the cast on the first of March, after which he was out of doors in a wheel chair on sunny days. He was evacuated to the United States on March 24, 1919, as a litter case, comparatively fat, of good color, with good appetite, and his wound practically healed. A new cast was in place, with the left lower extremity in abduction.

This patient received, for the purpose of dressing his wounds, about twenty administrations of anesthesia by Savariaud's method, of an average duration of six to eight minutes. In our opinion, our ability to discontinue

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them contributed materially to improvement in his general condition—particularly to a reduction in pulse rate. Frequent urine examination failed to show evidence of postanesthetic acidosis.

Case II. E. M. H., Private, Co. 2, 147th Inf. White; 22 years old.

History negative previous to injury.

September 27, 1918: Sustained penetrating and perforating machine-gun bullet wound of left hip region, while in front line action. He received first aid.

October 2, 1918: "Infection present, drainage of joint by anterior incision. Diagnosis—pyemia; abscess of right hip, left hip, shoulder and sacrum. Bad condition. Abscesses opened posterior left thigh and anterior to left great trochanter, drainage and Dakin's. Voluntary bowel movements in bed, septic diarrhea, bed sores. Ready for evacuation Dec. 28, 1918, as Class D." (These notes from Field Records.)

January 10, 1919: About three and a half months after injury he was admitted to U. S. A. Base Hospital No. 216. His general condition was serious. There were extreme emaciation, facial appearance of profound sepsis, pallor of skin and mucous membranes, persistently large pupils, extreme irritability and depression, marked pain in left hip upon the least motion; septic diarrhea, with upward of ten to twelve movements per day, which, on account of the pain caused by any effort at getting on a bed-pan, he voided directly into the bed; anorexia, septic type of temperature, soft, quick pulse from 100 to 110, cough with purulent expectoration but without pulmonary signs beyond a few large bronchial rales; slightly extended abdomen, with thin, "scurfy" belly wall. Heart negative. Skin showed generalized scabies and pyodermia. Four extensive bed-sores over the sacrum, with exposure of bone. There was pressure necrosis over the left ischial spine and below the left anterior superior spine from a Thomas splint. A 4-inch scar in the adductor mass, with central sinus, and a scar running towards the great trochanter from below the anterior superior spine, with sinus, were present, with free discharge from both of pus showing non-hemolytic streptococci and staphylococci but without anaerobes. Marked induration about the hip and the upper third of the thigh. The scar tissue was "soggy" and very unhealthy. The calf of the left leg was nearly entirely gone, leaving a large unhealed ulcer. On both heels were areas of pressure necrosis. The skin elsewhere over the left lower extremity was in bad condition from adhesive, scabies and pyodermia. This patient presented as pitiful and distressing a picture as could be imagined.

Urine examination showed febrile albuminuria. Blood count showed moderate polymorphonuclear leucocytosis. Blood culture was negative. Sputum examination was negative.

X-ray Examination.—Infectious destructive process involving head of femur and acetabulum with comminuted fracture of latter.

In this case, also, general treatment and careful nursing were instituted to improve his condition, but without any definite result excepting in the status of his skin lesions. He required sedatives to afford him any sleep, his diarrhea kept him in a constantly filthy condition, he could be dressed only under anesthesia, his sepsis progressed. Maj. Chas. F. Nassau, M. C., Chief of Surgical Service, U. S. A. Base Hospital No. 38, who saw this patient in consultation with us, thought that hip joint amputation was indicated, but that he would not survive this formidable operation at one sitting, and recommended primary resection of the femoral head and subsequent completion of the amputation.

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Operation.—January 13, 1919: Ether. Citrated blood transfusion (600 c.c.) during operation, without which it is almost certain this patient would have been lost. An incision was made beginning close to the anterior superior spine running towards the great trochanter, then down the outer side of thigh, to the bone, for about four inches below the great trochanter. The scar of the old incision and sinus was excised so far as possible. The femur was cleared in its entire circumference below the great trochanter and divided at this level with a Gigli saw. The upper fragment was grasped with lion-jawed forceps. The femoral head and neck were cleared by cutting attachments to the great trochanter and digital fossa, and following it to acetabulum along the posterior surface. The remainder of the neck and head was easily cleared and removed. The joint capsule could scarcely be identified. There was marked necrosis of the acetabulum and after thorough curettement, pus was found to have passed through its floor to its inner surface but apparently did not pass far in any direction from the acetabulum, nor beyond its medial musculo-fascial boundary. The medulla at the upper end of the shaft of the femur showed no gross change. Several infected and necrotic masses were removed from the tissues, the largst about 1½" x 2", composed of scar, muscle and fibro-cartilaginous material, partially infiltrated with lime salts. Hemorrhage was controlled by a few suture ligatures and packing with iodoform gauze. Time of operation, twenty minutes. Time of anaesthesia (including cast application), one hour and ten minutes.

A plaster cast was applied, including trunk, pelvis, both lower extremities, with the left in abduction, windows being cut at wounds and bed-sores. This was done in the half hope that fixation might be obtained for a short time at least. Three days later, however, it was necessary to remove this and trust to sandbags for support. Fixation by any other means was not possible.

Tetanus antitoxin (1,500 units) was given the day of and on the sixth and twelfth days after operation.

Pathological Report.—Microscopical appearance: Specimen consists of head, neck and that portion of shaft which is 1 cm. below great trochanter of femur. The head shows extensive erosion of the articular cartilage and slight necrosis of bone. The medulla of the shaft is grayish, with fiery red mottling.

Microscopical findings: (1) Section taken through head of femur. The articular cartilage shows extensive necrosis and has superimposed a layer of inflammatory exudate, composed of much fibrin, intermingled with a few polymorphonuclear leucocytes. The cancellous portion shows sub-acute and chronic inflammation. Diagnosis: Acute arthritis; sub-acute and chronic osteomyelitis. (2) Section taken from upper end of shaft of femur. Shows an acute osteomyelitis.

Progress.—His condition was grave for forty-eight hours. After the removal of the cast he was more comfortable. His appetite increased, sepsis lessened and he showed local and general improvement. Physiological rest had been so improved that, beginning a few days after resection, he slept without morphia or without craving for it. This is notable in view of his previous requirements in this hospital and his statements as to the frequency with which it had been administered previous to his admission here. It was still necessary to dress him under anesthesia. His diarrhea cleared up very rapidly. Inability, however, to fix the limb gave endless trouble. It was difficult to prevent pocketing at the site of operation because

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of this flail joint in the position he sought for comfort. The wound in the adductor mass drained profusely at first but lessened some after the resection. A collection of pus formed on the outer side of the calf just below the knee and required drainage. His bed-sores healed reluctantly. He was afebrile, had gained in weight, was sleeping fairly well. Generally, he was much better; locally, his condition had come to a standstill, and it was decided to complete the amputation.

February 25, 1919: Ether. Citrated blood transfusion (600 c.c.). Femoral artery and vein exposed and ligated at apex of Scarpa's triangle. Thigh amputated by open flap (guillotine method) about three inches below great trochanter. Hemorrhage controlled by ligatures. Necrotic tissue removed. The sinus into upper end of adductor remnants in flap was laid open. Packing was inserted into acetabulum. Dressed.

Progress.—Reaction excellent. Packing removed on third day, and Carrel-Dakin installation begun. Streptococci still present. Progress has been uneventful to date, with the exception of one small collection of pus in a too rapidly closing inner edge of amputation wound. The bed-sores, relieved of pressure, healed completely. Immediate and marked gain of weight took place. His course has been afebrile to date.

On April 1, 1919, he was ready for return to the United States as a litter case, in excellent condition, with hip region healed excepting a small clean granulating area along line of incision.

This patient had anesthesia (Savariaud's method) about forty times without any obvious ill effects. Frequent urine examinations failed to show acidosis.

Discussion.—The future will bring up many questions of great importance to these two men—on the one hand, whether the new flail, probably later ankylosed, hip joint and shortened extremity will be useful; on the other hand, of an existence on crutches, or the possibility of an artificial limb. These questions are of minor importance with regard to the fact that the two men are living, and these questions must be utterly disregarded in the determination of that course of surgery which, in the pressure of the grave emergency, offers a chance of life.

Both cases emphasize the following surgical principles:

(*a*) Penetrating and perforating infected wounds are accomplished by the spread of infection along many unrestricted paths which follow no such well-defined course as do some of the hematogenous or lymphogenous infections of this area, and cannot be drained by any single incision.

(*b*) Chronic pyogenic processes involving both the head of the femur and the acetabulum cannot be properly drained excepting by resection of the femoral head.

(*c*) In all cases where resection is practised, the acetabulum should be thoroughly explored and, if necrotic, should be sufficiently removed to furnish ample drainage from its internal surface.

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(*d*) Resection in the hands of only moderately experienced surgeons is a brief operation and eliminates a large amount of shock involved in hip joint amputation.

(*e*) Resection alone, however, is attended with certain shock, and this should be combatted with the prophylactic transfusion of citrated blood during the operation.

(*f*) Removal of the head is facilitated by first separating it from the shaft by Gigli saw (the easiest and most rapid method) and by clearing its trochanteric and posterior surface first.

(*g*) Completion of the hip joint amputation subsequent to resection is simple, rapid of performance, and in no comparison in severity with the entire formidable operation.

(*h*) Where comminution of the head is extensive, with considerable separation of fragments and sinuses leading to the skin surface, drainage is correspondingly greater, and in parallel cases microscopical examination will show less acute changes.

(*i*) The extensive, diffuse, new and unhealthy bone deposits which occur in and about an infected joint which is improperly drained and is without physiological rest.

(*j*) The absolute necessity for the simultaneous exhibition of proper drainage and proper fixation.

(*k*) The utter uselessness of Dakin's fluid without first following Carrel's injunction as to the proper surgical preparation of the wound.

We express our indebtedness to Maj. John W. Moore, M. C., in charge of Central Laboratory, Hospital Center, Nantes, for his pathological reports of specimens.

ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS, OCTOBER 13th to 15th, 1919, AT ST. LOUIS, MISSOURI. DO NOT FORGET IT.

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ORDNANCE AND ITS EFFECTS

By Major CHESTER R. SNOW
Trench Artillery

(With eight illustrations)

THE term "Ordnance," in its broadest sense, includes nearly every tool and weapon used in fighting. Thus it embraces everything from the trench knife and war club through machine guns and grenades to the heaviest artillery weapons.

We will consider briefly each of the principal weapons now in use.

Trench knife and *war club* cannot be said to be new weapons, but at least the use of them is new to soldiers of the present generation. Their effect, and also that of the bayonet, is obvious, so that nothing further need be said of them.

The rifle is the principal weapon in modern warfare. The rifles of the different belligerents differ but slightly in appearance, size and mechanism and our own .30 caliber Springfield may be taken as typical of all. The bullet is of lead with a cupro-nickel jacket, weighing 150 grains, and has a muzzle velocity of 2,700 foot-seconds. The rifle is sighted for firing up to 2,500 yards, and at 45 degrees elevation it will carry as far as 5,400 yards, or a little over 3 miles. At 200 yards the bullet will penetrate 0.3 inch of steel plate, 60 inches of pine board or greasy clay, about 20 inches of loam, and 9 inches of dry sand. At 600 yards it will penetrate 12 inches of dry sand. This difference in the case of sand is due to the fact that at the shorter range the bullet is deformed by its excessive energy, and consequently its penetration is reduced. In all other substances the penetration is greater at the shorter ranges. On account of its great energy the bullet has great shocking power as well as penetration.

The *pistol* is a minor weapon in this war. The French officers provide themselves with such pistols as they choose and have calibers ranging from .32 to .45. A German pistol that I have seen was about a .41 caliber. Our army uses the .45 Colt automatic pistol or S. & W. revolver, using the same cartridge. The bullet is of lead, .45 inch in diameter, the outside being a cupro-nickel jacket. It has a muzzle velocity of 800 feet-seconds and at ordinary ranges at which a pistol is used it will penetrate 6 inches of pine. A one-inch penetration of pine is considered the equivalent of a severe wound. This pistol was designed to give a rapid fire and great shock effect. The .38-caliber revolver, which was abandoned for the .45, had a higher muzzle velocity and greater penetration, but not sufficient shock or stopping power. One incident, which

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led to the change to the .45 caliber was the fact that in the Philippines an officer fired six shots from the .38 into a native who continued his rush and severely injured the officer with a bolo before dropping dead.

The sawed-off shotgun is in use in this war principally for trench cleaners. It is very effective up to 60 yards, and at these ranges is more effective than the rifle on account of the number of shot and their tearing effect.

Grenades may be classified as hand grenades and rifle grenades.

The hand grenades are of two principal types—the defensive and offensive grenades.

The defensive grenade is made with a heavy body checkered with lines of weakness to insure complete fragmentation, and it carries a heavy charge of high explosive. The fragments are killing up to 50 or 75 yards and dangerous up to 100 yards; hence the person throwing it must take cover in a trench or shell hole to avoid fragments of his own grenade.

The offensive grenade has a body of light tins and contains a large charge of high explosive. Its extreme killing radius is only 8 to 10 yards, the splinters of the light body being very small, and its blast effect is depended upon to do the damage.

Grenades are also filled with smoke compounds, and tear and poisonous gases. These grenades are used by the trench cleaners in clearing dugouts. It is evident that in a dugout a man may take shelter from the fragments of an explosive grenade by going to another compartment or taking cover, but the gas grenades will penetrate to every part, and the fillers of some are gases which, it is claimed, will penetrate the German gas mask. (British K. J. grenade.)

All modern hand grenades are ignited by a time fuse which lights the powder train as the grenade leaves the hand. The fuses are timed to burst the grenade five seconds later. Grenades may be thrown up to 35 yards, the distance depending upon the strength and skill of the thrower and the weight of the grenade.

Rifle grenades are similar to hand grenades but are propelled by using a rifle with a suitable attachment for holding the particular grenade. They may be fired by an ordinary cartridge or by a special blank cartridge, according to the particular model. Rifle grenades are filled with the same substance as hand grenades, and their effects are the same. The advantage is that their range is greater, being as high as 210 yards. The rifle from which they are fired is usually placed in a special frame, so that it may be given any desired elevation. We know that a man in a trench or shell hole cannot be reached by a rifle bullet. He can, however, be reached with a grenade which may be dropped into the trench, descending at a steep slope. I might add that a grenade is a very dangerous weapon and should be handled only by those who have special training in its use.

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Automatic rifles differ from machine guns in being light enough to be easily used by one man. They can be fired by a man advancing, and the rate of fire is up to 60 shots a minute. They use the same cartridge as the regular rifle, and consequently their effect is the same.

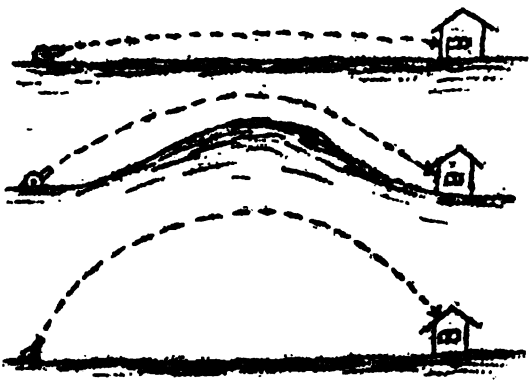
Machine guns can be fired up to a rate of 400 shots per minute, the rate being governed by the operator by adjusting the gas escape or the special mechanism, according to the model. They use the same cartridge as other small arms. In this war indirect fire for machine guns has been developed and, consequently, their use in barrage fire. When using indirect fire the machine guns are placed well to the rear of the target and fire at high angles. Consequently the slopes of fall are very steep, and overhead cover is needed for protection against it.

We next come to the weapons of the artilleryman, or what is termed ordnance within the most common meaning of the word.

The artilleryman's weapon consists essentially of the tube or barrel, the carriage on which it is mounted for firing, the explosive used both as a propellant and as a bursting charge for the projectile, and the projectile.

The barrel of the gun is very interesting in itself in the ingenious methods used to make it withstand great internal pressures, but time will not permit us to consider its construction.

The carriage has two purposes, to take up the recoil and to direct the fire. This second purpose only concerns us. We classify fire into three kinds according to its use, namely: direct fire, where the gun is fired at angles up to 15 degrees; curved fire, when the projectile departs at angles between 15 and 45 degrees; and high angle fire, when the angle of departure is between 45 and 90 degrees. Guns designed especially for curved fire are called howitzers, although in the present war all guns are mounted so that they can be fired at angles up to 45 degrees.



Guns designed for high angle fire are called mortars. The needs for these classes of fire are readily seen. Suppose we have a target which is greater in dimension vertically than horizontally, as the walls of a building. Direct fire is the most useful.

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Suppose we must fire over a high hill or a woods. Obviously curved fire is called for, while if the target presents greater vulnerability on top than on the sides, as the top of a building or shelter, we need high angle fire. The kind of carriage provides for this.

The subject of propellants leads us to consider explosives. An explosive is a solid or a liquid which can be readily converted to a gas. An explosive consists essentially of a combustible substance, as carbon, and an oxygen producer as a nitrate or chlorate.

Explosives are divided into three classes: (1) Powders or propellants; (2) detonating explosives; and (3) detonators.

Powders or propellants burn in the same manner as wood or coal, only, having their oxygen contained within them, they burn at a much greater rate, and this rate increases with the temperature and pressure under which combustion takes place. Keep in mind for the moment that it is simple combustion, and then we can contrast them with the second class, detonating explosives or high explosives. In these we do not have combustion, but rather an instantaneous disruption of the force which binds together the atoms in the molecule, which causes the atoms to depart from their present comparatively unstable combinations as nitrates or chlorates and form more stable ones as carbon dioxide and nitric oxide, and others, according to the composition of the explosives. This class of explosives is used in blasting and as shell fillers.

The next class is the detonating explosive, which is characterized by mercury fulminate. Explosives of this class are not only of a higher order of detonation than those of the second class but they have the power of initiating detonation, or the disruption of the molecular bond in explosives of the second class. Take, for example, trinitrotoluene, a high explosive and a most common shell filler. If we ignite it with a match in the open it will melt and slowly burn. If we light it when confined it will burn more quickly, but will cause an explosion only as the gases accumulate from the rather rapid combustion. But if we explode some mercury fulminate in contact with it, we immediately obtain a detonation of the whole mass.

High explosives have individual characteristics, and their utilization as shell fillers is governed accordingly. Picric acid, for example, is comparatively insensitive, but very quick and of great disruptive power. It, or some of its compounds, is the almost universal filler for high velocity shells. The speed of these explosives is such that it tends to disrupt rather than remove material. On the other hand, certain chlorate explosives have 50 per cent more power of removing earth than the picrates. They are used more for the destruction of dugouts, but their great sensitiveness limits the use to shells of low velocity.

Projectiles as regards their effect may be classified as follows:

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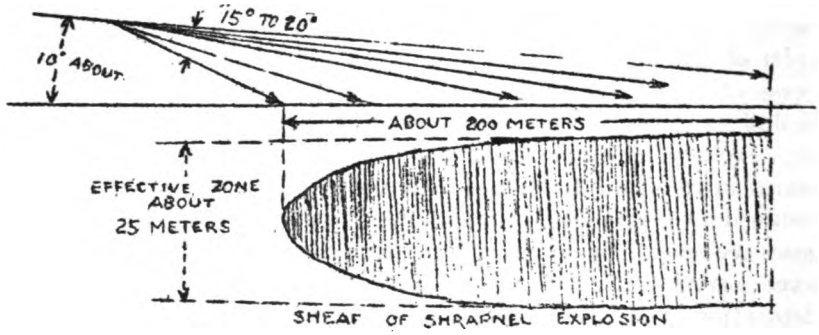
1. Shrapnel

2. High Explosive Shell. { Air, or time fuse bursts. / Ground or percussion fuse bursts. } — { With instantaneous fuse. / With non-delay action fuse. / With delay action fuse. }

The shrapnel consists of a case with a charge in the base and the rest of the case filled up with balls of lead or iron about an inch in diameter, and the interstices filled with a smoke-producing compound, which is useful to show the point of burst in order that the fire may be adjusted.

Shrapnel is used mostly in guns of about 3-inch caliber, as the French 75 and the German 77, and such a shell will contain about 260 of these balls. The head of the shrapnel holds a combination time and percussion fuse, the time fuse being an arrangement by which the interior charge is ignited a certain length of time after the projectile starts and causes the balls to be projected forward. The percussion element of the combination fuses detonates upon hitting the ground in case the shrapnel does not burst in the air. The effect of shrapnel is to sweep a cone-



shaped area, the area varying in size with the height of the burst, the higher the burst the more area covered and consequently the thinner pattern made by the 261 balls. The penetration of the individual balls is slight, 10 cm. of earth giving protection, and shrapnel is of slight use against troops under cover. However, it may be effectively used against troops in open trenches by enfilading the trench or by bursting the shrapnel at such a point in the trajectory that the cone of dispersion will be directed downward.

High explosive shells, equipped with a time fuse, are fired from both field guns and howitzers. The field gun is a high velocity cannon having

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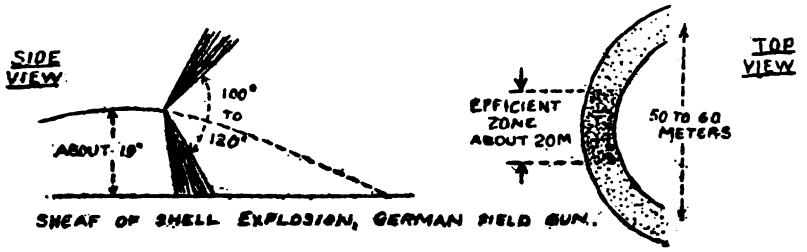
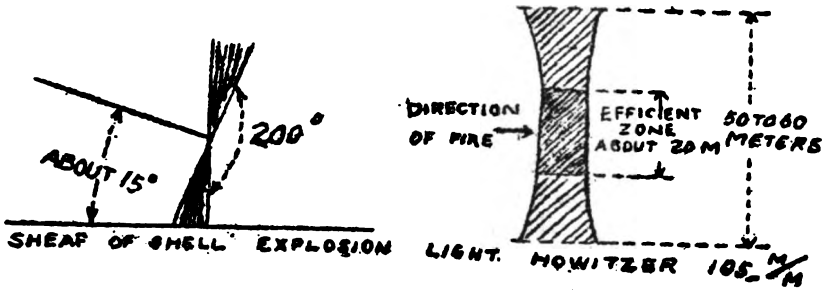
a flat trajectory. A shell, from the German 77 for example, bursting in the air will give a cone of dispersion of the form shown, the direction given to the fragments being the resultant of the forward movement of the shell, and the lateral motion imparted by the bursting charge.



The howitzer uses curved fire and low velocities. Therefore, the air burst of a shell fired from a howitzer, the German 105 for example, will give a somewhat different dispersion of the fragments, throwing some directly downward and to the rear. The rearward motion of the fragments is due in part to the steep slope of fall of the projectile and to its low velocity.



The thing to note in regard to these shells is the fact that while a trench may give cover against the 77 H. S. shell, overhead cover is essential for protection against the shells fired from howitzers. The fragments from these shells are very numerous and very irregular in shape, and at first are propelled with great speed, which they rapidly lose. The penetration of the fragments is not great, except close to the point of burst.

The high explosive shell with a percussion fuse will give three effects according to whether an instantaneous, a slight delay action (say 1/25th second) or a long delay action (say 1/6th second) fuse is used. The instantaneous fuse, as its name indicates, detonates the projectile the instant it strikes the ground. It makes very little, if any, crater, and the fragments are projected horizontally in all directions, making a very destructive projectile against personnel or wire entanglements. The slight delay fuse or non-delay fuse makes but a small crater—say from

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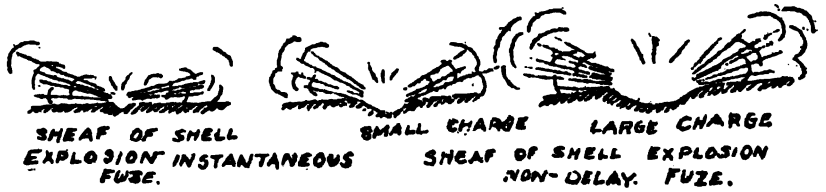
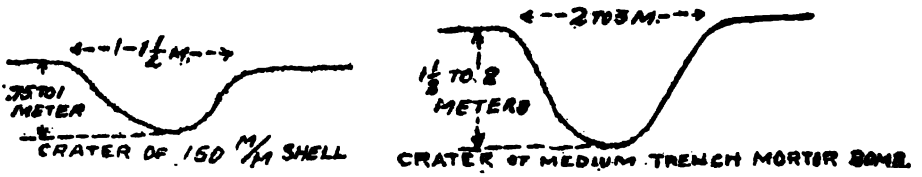
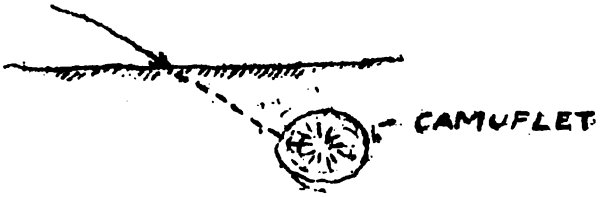
6 inches to a foot deep—and sends part of its fragments and the material from the crater upward and downward at varying angles, depending upon the depth it has penetrated and the strength of the explosion. We may have craters like this with the resultant flight of debris and fragments.



The H. E. shell, with the long-delay action fuse, is used against shelters and dugouts, the idea being that it shall not detonate until it has penetrated the ground a considerable distance. An ordinary 6-inch shell with delay action in soft soil makes a crater about 1½ meters across the top and about 1 meter deep. A 58-mm. trench mortar bomb will make a crater 2 or 3 meters in diameter and about 2 meters deep.



In some cases a shell will penetrate the ground so far that the explosive contained in it has not sufficient power to raise the earth above it. In this case we have what is called a camuflet. Such a burst near a dugout is very destructive.



One case I have observed is interesting in connection with protection fuse shells. You will notice that most all old soldiers drop very quickly to the ground when a shell is heard approaching. The value of this is proven. A shell dropped 40 feet from a group of men without cover; six of them were hit by fragments, two being killed instantly and three severely wounded, but in no case was one of them hit less than 24 inches above the ground. One man still nearer to the shell heard it coming and dropped to the ground. He was not hit. The evidence shows that had all the men dropped instantly to the ground none would have been hurt.

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This shell was about 105-mm. caliber. It had a very quick fuse and made a crater only about 9 inches deep and 24 inches in diameter. Some fragments were about 2 cubic inches in size.

So much for the effect of the shells themselves. The destruction done by the shells will be influenced by the way in which they are used, and this has changed in a very marked manner from that of previous wars. These changes may be considered as:

1. The greater proportion of guns of large caliber in use.
2. The greater number of guns of all calibers in use and the consequent prolonged and violent artillery activity.
3. The use of barrage fire, which is made possible by the great number of guns.

The great number of guns and the large assortment of calibers, with ranges varying up to 38,000 meters, have enabled the guns to be distributed in depth. Consequently, on a given length of front, many more guns may be used than formerly, and targets at a greater distance behind the lines may be reached. The use of a greater number of guns of all calibers has enabled the density of fire to be increased. More enemy guns must be put out of action before one side remains with a marked superiority of artillery. The long ranges of the guns enables them to have a greater choice of positions from which to fire, and consequently more time is required to search them out and neutralize them.

The great density of fire permits the use of the barrage or curtain of fire, which is made by all guns, including machine guns, being directed upon points so that the whole makes an impassable barrier. When a barrage is put down the bulk of the fire is directed at trench junctions, communication trenches and roads where the enemy would most probably try to pass.

These points of dense fire can be learned by observation, and one can use this information to advantage should it be necessary to attempt a passage through a barrage.

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STRUCTURE AND SYSTEMATIC RELATIONSHIPS OF THE "IODINE CYSTS" FROM HUMAN FECES[1]

By Major CHARLES ATWOOD KOFOID, *Sanitary Corps, U. S. Army;* 2d Lieutenant SIDNEY I. KORNHAUSER, *Sanitary Corps, U. S. Army;* and OLIVE SWEZY, Ph.D.

(With twenty-five illustrations)

THE recent literature dealing with infections of the human digestive tract by Protozoa contains references to a problematical organism designated, because of its iodophylic inclusions, as the "Iodine Cyst." It occurs in human feces and has been reported repeatedly by several investigators in Great Britain as occurring in course of routine examinations of stools of hospital patients and others. The precise nature of this problematical organism and its systematic affinities appear thus far to remain in obscurity. Furthermore the accounts and figures of its structure are somewhat incomplete and leave the reader in doubt as to the content of the term.

In the course of a review of the literature and an examination of over 2,500 stools of soldiers of the U. S. Army, we have reached the conclusion that these problematical organisms include, primarily, a larger race of *Endamoeba nana* than has hitherto been recognized, with the probability that an undescribed yeast-like organism has also been included therein by Wenyon and O'Connor.

The first reference to these puzzling organisms is that of Thomson and Thomson (1916), who recognized them as "peculiar bodies of probably protozoan nature found in the stools of dysentery patients." They deal with a variety of structures of organic origin, including what appear to be polymorphic leucocytes, fragments of amebas, degenerating amebas, and, in their figures 1 to 3, typical representatives of the large race of *Endamoeba nana.* They give no name to these structures and do not assign them to *Endamoeba.*

Notice was again independently drawn to these peculiar cysts by Wenyon (1915*b*), who, in an appendix to a republished earlier paper (1915*a*), writes as follows:

> In addition to the organisms found so frequently in the human intestine there has appeared in the feces of some of the cases from Gallipoli a spherical body, which is usually smaller but may be equal in size to the cysts of *Entamoeba histolytica.* It is probably of a vegetable nature and, in feces kept for some time, there is an indication that it elongates and may reproduce by simple division, or even grow into filaments or hyphae. It may thus be the spore of a fungus, but its importance is that it can be mistaken, especially when it is large, for the cysts of the pathogenic *Entamoeba.* It

[1] From the U. S. Army Laboratory, Port of Embarkation, New York City, Maj. E. H. Soborer in charge.

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is shown in the photomicrographs 7 and 8 of the plate. Each cyst has a single nucleus which is much smaller than the single nucleus of the single nuclear stage of *E. histolytica* cyst. In addition to the nucleus which appears in the fresh condition as a small granular ring there are one or more refractile bodies of varying size which again bear some resemblance to the chromidial bodies seen in the cysts of *E. histolytica*. These bodies are strongly iodophylic and in preparations of feces made with Weigert's iodine solution they become a dark brown, almost mahogany color, as shown in the photomicrographs 7 and 8. The iodophylic body or bodies are often much larger and more irregularly shaped than shown in the plate.

Somewhat more than a year later Wenyon and O'Connor (1917*a*, p. 355; 1917*b*, p. 83) gave in greater detail an account of these "Iodine Cysts," together with six figures (their Plate 3, Figs. 12–17) of the organisms, as follows:

During the early months of the year these peculiar structures, with their strongly iodophylic bodies, were frequently met with in the stools. They were present sometimes in very large numbers and it is interesting to note that the most intense infections were met with amongst a series of native prisoners we examined in Hadra prison. They were present in 14.8 per cent of the prisoners.

Examinations of the daily rations microscopically did not reveal any source of infection.

The "Iodine Cysts" are generally easily recognized if one employs iodine. Sometimes without this it is difficult to identify them certainly, as the iodophylic body may be mistaken for the chromidial body of a cyst of *E. histolytica*. The iodophylic body, however, tends to be rounded or lobed, while chromidial bodies in the *E. histolytica* cysts are generally rodlike. The "Iodine Cysts" vary greatly in size and shape. They may be quite small with a diameter of 7 or 8 microns, or large with a diameter of 15 microns or more. Though most usually they tend to be circular or oval in outline they may be lobed or show processes which suggest an outgrowth into a filament. The single nucleus is smaller than the nucleus in the single-nuclear *E. histolytica* cyst, and furthermore it is different in appearance and structure. In one or two cases we have come across fairly large infections of cystic structures which resemble the "Iodine Cysts" in every way except for the absence of the iodophylic body. These caused us a good deal of difficulty as there was a decided resemblance to *E. histolytica* cysts. After careful observation of the cases it was possible to make up one's mind that these were really "Iodine Cysts" minus the iodophylic bodies. In typical "Iodine Cysts" infections, where the majority of the cysts have the characteristic iodophylic bodies, a few may be seen in which these are absent (Plate 3, Fig. 15).

In one or two cases there have occurred in the stool larger spherical cysts which look very much like cysts of *E. coli* with a single nucleus, which is a spherical body with a thick nuclear membrane, while the central part is clear and unoccupied by granules or other structures. It has the appearance of a homogeneous body with a central vacuole. When first seen it was thought the cysts were peculiar forms of the cysts of *E. coli*, but by following the cases for a few days it was found that there was no tendency for recognizable stages of *E. coli* cysts to appear. It was evident that they were not amebic cysts. It seems most probable that they represent large "Iodine Cysts" which are devoid of iodophylic bodies or structures of an allied nature. One such case as this was seen by one of us during the routine examinations in London of patients returning from Gallipoli at the end of 1915.

In this same paper Wenyon and O'Connor described *Endamoeba nana* t make no reference in the text to the presence of iodophylic bodies

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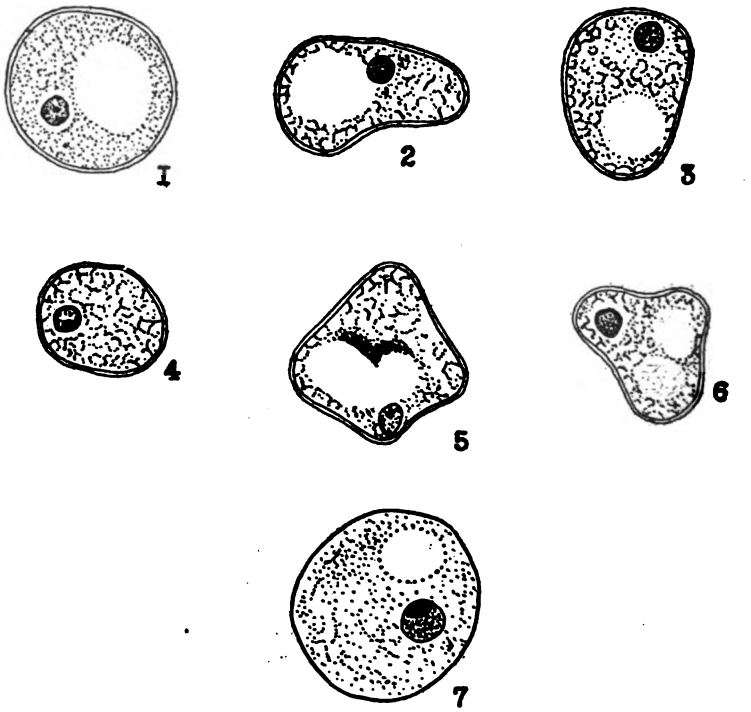
therein, either in free ameba or in cysts. Nor do such bodies appear in their figures of the cysts, though the large vacuoles present in two of their figures of free amebas (their Plate 1, Figs. 14, 15), plainly of sluggish rounded up forms such as appear in stools along with encysted stages, may well have been occupied by the glycogen body, or iodophylic body of Wenyon and O'Connor. Furthermore, in their description of *E. nana* they give 7 to 8 microns as the diameter of the spherical cysts



FIGS. 1–6.—"Iodine Cysts" from stained material. After Wenyon and O'Conner (1917, Plate 3, Figs. 12–17). The iodophylic body appears as a vacuole. Fig. 4 shows a cyst without iodophylic body. The cysts measure 7 to 10 microns.
FIG. 7.—"Iodine Cyst" after Matthews (1918, Plate 1, Fig. 24).

and 8 to 10 microns as the length of the elongated cysts, while the "Iodine Cysts" are stated to range from 7 to 15 microns.

In their helpful and critical review of the three common intestinal endamebas of man, Dobell and Jepps (1917) note the occurrence sometimes in *E. nana* of the mass of substance colored dark brown by iodine and identify it as glycogen. Their figures do not show its occurrence or relative size, with the exception of that of one cyst in which the glycogen vacuole is indistinctly indicated. They also extend the upper dimensions of the species to 12 microns.

In a later paper Matthews (1918) briefly refers to these cysts, adopt-

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ing with reference thereto much the same position as Wenyon and O'Connor (1917*b*, pp. 83–84), as follows:

> These cysts were first noted by Wenyon (1915) and have been more fully described by Wenyon and O'Connor (1917). They vary greatly in size, covering practically the same range in size as the cysts of *E. histolytica*, and it is with these that they are likely to be confused. This is particularly the case when the structures are examined in saline. The iodophylic body which is most characteristic of "Iodine Cysts" may simulate the chromatoid body of an *E. histolytica* cyst, though it is generally not rod-shaped but rounded or lobed. In iodine this inclusion stains deep brown and has well-defined edges. Occasionally "Iodine Cysts" are found without the iodophylic body, and it is then that the organism may very closely resemble a cyst of *E. histolytica*. The nucleus is, however, distinctly smaller than the nucleus of a uninucleate *E. histolytica* cyst, and is quite different in structure (see Fig. 24 and compare with Figs. 1, 2, and 5). (Fig. 24 was drawn from fixed material stained with iron hematoxylin. The iodophylic body shows as a clear space, but in a cyst mounted in iodine this space would appear dark brown in color and the nuclear structure would be less clearly defined.) It should also be noted that small "Iodine Cysts" may be confused with *E. nana* or *Tetramitus* cysts when these contain, as they sometimes do deeply staining glycogen vacuoles. "Iodine Cysts" are not protozoal. They probably represent some stage in the life history of a vegetable organism but, so far, all attempts to cultivate them have failed.

Matthew's figure (our Fig. 7) of the "Iodine Cyst" is indistinguishable in our opinion from a large mononucleate *Endamoeba nana*. It has a small nucleus with the same nuclear structure with peripheral chromatin plaque on the nuclear membrane, and empty glycogen vacuole. It is perhaps significant that Matthews notes that small "Iodine Cysts" may be confused with *E. nana* or *Tetramitus* cysts when these contain deeply staining glycogen vacuoles, and also that he gives no criterions by means of which they may be distinguished from *E. nana*. He makes no mention of spherical cysts with a single clear, spherical "nucleus" without central granule such as Wenyon and O'Connor include in their "Iodine Cyst." It thus seems probable that the "Iodine Cyst" of Matthews consists solely of large mononucleate *Endamoeba nana*.

In 1917 Beaurepaire Aragoa introduced the term "pseudo-cysts of *Endamoeba histolytica*" applying this designation to the cysts described by Schaudinn for *E. histolytica*. These bodies are not, however, any phase of the "Iodine Cyst" of Wenyon and O'Connor as the terminology might lead one to expect, but are, according to Beaurepaire Aragoa the small secondary cysts of *Blastocystis* which he believes Schaudinn mistook for the cysts of the dysenteric ameba.

One infers from the review of Kuenen and Schwellengrebel (1917), the original of which has not been available, and from Kuenen (1918) that the iodine cysts of these authors are the large mononucleate *Endamoeba nana* only. The dimensions (9–13 microns), the brown-staining "iodine body," the cap-like chromatin mass of the nucleus and the chromatoidal grains in the cytoplasm, are all characteristics of *Enda-*

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moeba nana. These authors apply the name *Pseudo-limax* to these organisms, but, in the literature at hand, without specific designation. They found the organisms in two persons from India and Java respectively.

Brug (1919) describes the ameboid stage of the Iodine Cysts, notes the excentric location of the chromatin mass but states that this is not directly on the membrane, as we find it, as a rule, in *Endamoeba nana.* Vacuoles containing bacteria or detritus occur in the cytoplasm, which is, however, a feature characteristic of *E. nana.* The "Iodine Cyst" stage is round or oval, 8 to 12 microns in diameter, with a homogeneous corpuscle which is not a "chromidium" like that of *E. dysenteriae* in shape, and stains a dark brown in iodine stain. Cysts are mononucleate, rarely binucleate. Brug concludes that the iodine cysts are phases of *Endolimax williamsi,* not referring to the species described by Wenyon and O'Conner as *Endamoeba nana.* The species known as *Endamoeba williamsi* Prowazek has usually been regarded as merely an aberrant form of *E. coli,* a view with which, after a review of the literature and of Brug's data and figures, we are in agreement. The nuclear conditions described by Brug in his "Iodine Cysts" appear to be closer to those of *Endamoeba nana* than to those of *E. williamsi* and *E. coli,* and are perhaps not irreconcilable with the nuclear conditions in *E. nana* in some phases. We therefore dissent from Brug's conclusion that the "Iodine Cysts" are *Endolimax williamsi,* especially in view of the lack of critical knowledge and good figures showing the range in form and nuclear conditions in this so-called species, and in view of the absence of a full discussion by Brug of the claims of *E. nana* as including the "Iodine Cysts."

From our own observations on human protistal infections we have come to the conclusion that the "Iodine Cyst" of Wenyon and O'Connor (1917 *a* and *b*) is a complex of two organisms including, first, the large mononucleate race, usually glycogen-bearing, of *Endamoeba nana,* and second, a hitherto undescribed phycomycete occurring in small numbers in the stools of many different individuals. The latter is their "large spherical cysts which look very much like cysts of *E. coli.*"

Our grounds for these conclusions are as follows: Under certain unknown conditions the cysts of human intestinal amebas and also those of the flagellate *Chilomastix mesnili* present, accumulated within their cytoplasm, considerable quantities of glycogen which stains a deep brown in iodine, and dissolves out in water, leaving, when compact, an empty vacuole in fixed material. In *Endamoeba coli* this is most evident and most frequently found in the large binucleate cysts where it occupies a central position, fills the central half or more of the cyst, and crowds the two nuclei peripherally. Its shape is subspherical or squarish with rounded angles, and is often indented by the two nuclei. Its

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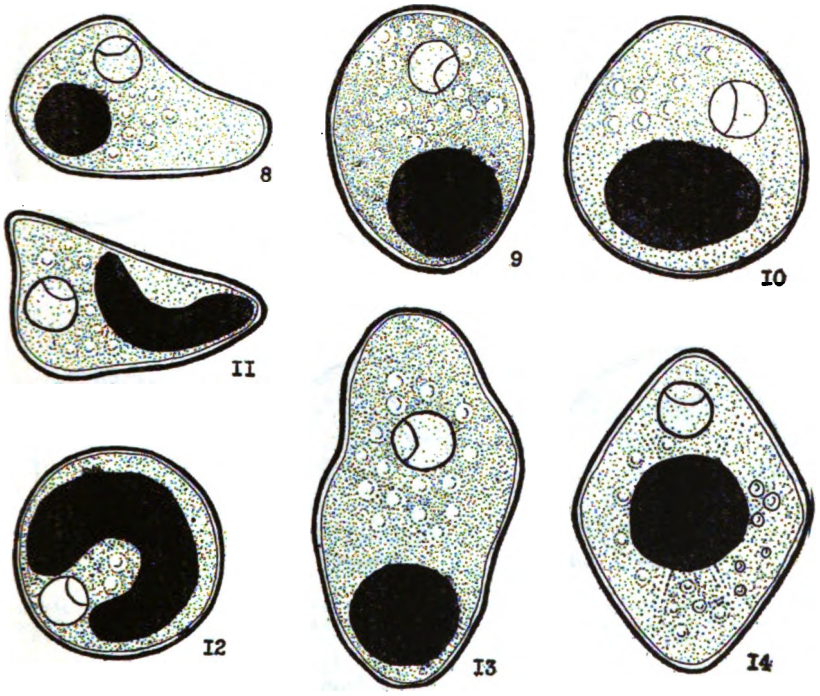
margins are rather sharply defined and usually merge with a slight haziness into the enclosing cytoplasm. In the still rarer four-nucleate cysts the glycogen mass is smaller, more diffuse or entirely lacking, while in the prevalent eight-nucleate and very rare sixteen-nucleate cysts the glycogen seems to have entirely disappeared.

The glycogen mass in *Endamoeba dysenteriae* is either diffused throughout the cytoplasm or gathered in diffusedly margined clouds. It occurs in races of all sizes but tends to be most frequently present and in largest amounts in the largest races. It is also found in the one-, two-, and four-nucleate cysts but, in our records, is found in only about 50 per cent of the last named as compared with 57 per cent of the mononucleate ones.



FIGS. 8–14.—*Endamoeba nana* from material stained with iodine-eosin stain. The iodophylic body or glycogen mass appears as a dark body. The cyst walls are shown as black lines. Note the irregular outlines of the cysts. X 2600.

In *Endamoeba nana* the glycogen mass is much more frequently found than in the other two common intestinal amebas, is of greater relative volume than in *E. dysenteriae*, is much denser, stains much more deeply, and has a very sharply marked periphery, not merging gradually into the surrounding cytoplasm as in the case of the other two species. It therefore leaves a very sharply defined vacuole in stained preparations in which the glycogen has been dissolved out by the water of the

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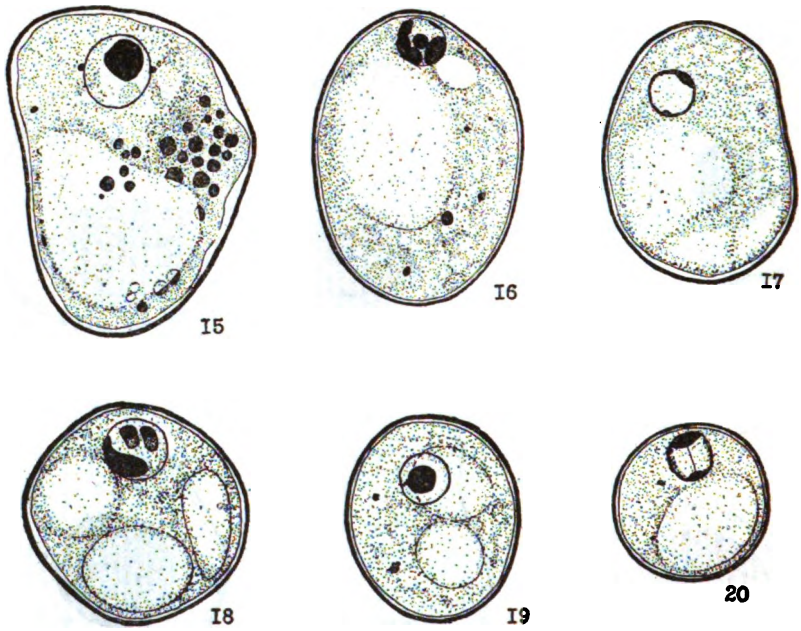
solutions used. This appears clearly in our figures which represent *E. nana* in iodine-eosin stain with the glycogen mass in black (Figs. 8–14) and in iron haematoxylin preparations in which the glycogen mass has been removed by solution, leaving a clear vacuole (Figs. 15–20).

The glycogen mass is more frequently found in individuals of *E. nana* than in either of the other intestinal amebas. It is also relatively larger and more abundant in the large mononucleate cysts than in the smaller cysts. In fact two nuclei are rarely found in these larger cysts and, as yet, we have not found four in them. It seems probable that there may be a decrease in size of the cysts as the glycogen decreases



FIGS. 15–20.—*Endamoeba nana* from material stained with iron hematoxylin. The glycogen appears as a clear vacuole. Note the irregular distribution of chromatin in the nucleus of figures 15–18. X 2600.

in volume and as the nuclei increase from two to four. The smaller cysts sometimes have only a very small, very dark sphere remaining, and a few only lack all trace of the glycogen.

There is thus in all three of the intestinal amebas a general tendency for the glycogen mass to be larger, and to be present more frequently in the earlier stages of the cyst, namely, in the one- and two-nucleate stages than in the later terminal ones with four, eight or sixteen nuclei. This phenomenon is apparently one of the depletion of reserve food supply stored up in the cytoplasm of the encysting organism as glycogen, and exhausted as mitosis proceeds and the cyst ages. The initial stages of this process in *Endamoeba nana*, when the glycogen is at its maximum,

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are the largest observed stages of the species and have the largest glycogen masses. The excentric inclusion of the relatively large glycogen mass tends to give to these stages a lack of uniformity in shape and a tendency for enlargement towards one end. These features also appear in Wenyon and O'Connor's figures (our Figs. 1–6) of their "Iodine Cysts" and afford evidence that these are the large mononucleate phases of *Endamoeba nana*.

Another line of evidence supporting this conclusion as to the identity of "Iodine Cysts" and *E. nana* is found in the nuclear structure. In our material (Figs. 8–20) the nucleus in these large, glycogen-laden cysts which we believe to be the "Iodine Cysts" is invariably of the *Endamoeba nana* type in the following particulars: In the first place the nucleus is relatively smaller than in *E. dysenteriae*. In smaller stages, 7 to 10 microns, such as Wenyon and O'Connor figure, the nucleus is from 1.5 to 2 microns. In their figures the diameters of the nuclei appear to run about 1.25 to 1.5 microns. They give dimensions of their cysts as 7 to 10 microns, but not their magnifications. In our larger cysts of 10 to 18 microns in longest diameter, the diameter of the spherical nucleus ranges from 2.5 in the smaller cysts to 4 microns in the largest ones and is generally about 3 microns. In the "Iodine Cyst" figured by Matthews (1917) the diameter of the cyst is 11.5 microns and of the nucleus, 2.5 microns (Fig. 7). The nuclear dimensions in the "Iodine Cysts" are thus comparable with those of *E. nana* which exhibits these nuclear dimensions.

In the second place the position of the nucleus is excentric, rather close to the periphery, or midway between the center and the periphery in the "Iodine Cysts," as also in *E. nana*, as reference to the figures will show.

In the third place the structure of the nucleus is that of *E. nana*. This is true in all of our material critically examined on this point, of the "Iodine Cyst" of Matthews (1917), but clearly so of only one cyst in Wenyon and O'Connor's figures (1917 *a* and *b*), namely, his Fig. 15, reproduced in our Fig. 4. This nuclear structure is characterized by the accumulation of the chromatin on one side of the spherical nucleus in a circular plaque, sometimes in several detached, irregular masses. In a few instances a rod from the center of the plaque crosses the nucleus to the opposite side to terminate on the membrane in a knoblike expansion. These resemble telophases of mitosis, the rod being the centrodesmose. The types of nuclei shown in Wenyon and O'Conner's figures are varied. Their Fig. 15 (our Fig. 4) is of the *E. nana* type commonly found, with a single large plaque. The nuclei in their other five figures all depart somewhat widely from the typical condition. Scattered local encrustations are shown in Fig. 13 (our Fig. 2), extended encrustation in Fig. 17 (our Fig. 6), and only small, local granules in Figs. 12, 14, and 16 (our

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Figs. 1, 3, and 5). These are not irreconcilable with nuclear conditions occasionally seen in glycogen-bearing *Endamoeba nana*, as will be seen on comparison with our Figs. 16 and 18. They are, however, not typical of that species. On the other hand, the nucleus in the single figure of Matthews (1917, pl. 1, Fig. 24, our Fig. 7) is typical of *E. nana*.

In the fourth place the nuclear membrane in *Endamoeba nana* and that of the single nucleus in the glycogen-laden "Iodine Cysts" is of the identical delicate, non-chromatin encrusted type except at the region of chromatin aggregation. It is detected with some difficulty even under the oil immersion, except in rare instances, when the centrodesmose is present and mitosis is pending or recently passed. At such times there is some chromatin on the nuclear membrane.

Additional evidence for the identity of *Endamoeba nana* and "Iodine Cysts" is found in the intergradation of the two in the matter of the size and volume of the glycogen mass. In extreme cases in the largest cysts it constitutes 0.3–0.5 of the total volume, and in smaller cysts may sometimes exceed 0.7. From such extremes all gradations exist down to the complete elimination of all localized iodine-staining glycogen. There is no line of demarkation between the two unless all glycogen-laden cysts are excluded from *Endamoeba nana*. Furthermore, it is possible to note the decrease in the volume of the glycogen masses in cysts in stools kept and examined daily for several days. In the stool from which the cysts in our figure were taken, the average diameter of the spheroidal mass in 20 cysts taken at random from the stool on the first day was 6.9 microns, with a range of 4.9 to 9.0 microns. On the second day the dimensions were 6.5 (4.9 to 8.1) microns, and on the third day 5.1 (4.5 to 6.7) microns, a decrease of 6 and 26 per cent respectively in the volume of the glycogen mass as the cysts aged during the three days.

In view of the evidences there appears to be no tenable alternative to the conclusion that the glycogen-laden cysts called "Iodine Cysts" by Wenyon and O'Connor and by Matthews are only the early phases of encystment of the several size races of *Endamoeba nana* in which the store of reserve food is at or near its maximum volume.

HOMOGENEOUS BODY WITH CENTRAL VACUOLE

It appears that Wenyon and O'Connor's account (1917) of the "Iodine Cyst" includes a reference to a cyst much like those of *Endamoeba coli* with a single nucleus. These are homogeneous with a central, spherical, nucleus-like vacuole without nuclear contents. They conclude that the structures are Iodine Cysts without iodophylic bodies. They report two cases of the occurrence of these bodies in stools.

In the course of 2,685 examinations of stools we have met with 190 instances of infection with cysts which we have referred to the "homo-

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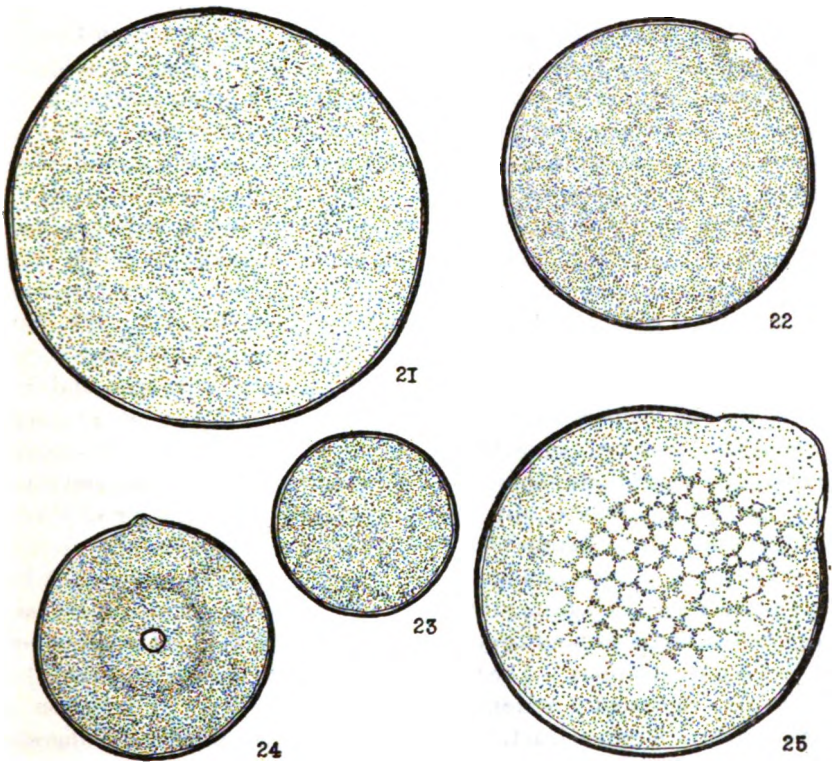
geneous body" of Wenyon and O'Connor. Not all, in fact very few, have the central vacuole, but those with the central vacuole appear to belong to the same category as those without, differing from them only in the presence of the vacuole. As Wenyon and O'Connor state, these homogeneous cysts are very much like those of *E. coli*, at least in normal salt or iodine-eosin stain. Their range in size, 10 to 30 microns, their smooth, spherical contour, their definite cyst wall of width and refractive index not unlike those of cysts of amebas, and their color are sug-



FIGS. 21–25.—"Homogeneous Body" as seen in material stained with iodine-eosin stain. Figs. 21–25 show undifferentiated character of the cytoplasm. Central vacuole appears in Fig. 24, and vacuolization of the cytoplasm in 25. The opening through the cyst wall appears in 22 and 24 and is greatly enlarged in Fig. 25. X 2600 except Fig. 25, which is 2300.

gestive of amebic cysts, but close inspection at once reveals differences. They never contain iodophylic glycogen masses, but are notable for the homogeneity of their contents. They range in size from 10 to 30 microns, as a rule, though we have found instances of cysts 7 microns in diameter. Measurements of 20 cysts in 19 cases of infection gave an average of 15.5 microns and a range of 10 to 24 microns. In shape they are quite regularly spherical, lacking the slight divergencies from that form which characterize *Endamoeba nana* as a rule, *E. coli* less

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frequently, and *E. dysenteriae* in still fewer instances, except in the smaller races.

The cyst wall is smooth, regular, and similar to that of *E. coli*, only rarely somewhat heavier. There is one point on certain cysts, possibly in many of them, for we have found it in several cases on search but not in others, where there is an interruption in the wall and a thin-walled, low protrusion projects beyond the periphery (Figs. 22, 25). There may be only a slight flattening at this point. The protrusion is suggestive of the initial stages of budding in yeasts, and the flattened surface may be the place of detachment of a daughter organism, or of the cyst or spore from a hyphal cell or filament or the initial stage of a hypha.

The contents of the cyst have the refractive appearance of protoplasm, considerable firmness, and a remarkable homogeneity. In many instances in physiological salt solution they have a greyish olive-green or greenish-brown color. In iodine-eosin stain they resist the eosin for a long time as do cysts of *Endamoeba*, but in some cases are soon tinged with the iodine. In the greater proportion of the cysts the contents are uniformly homogeneous throughout, showing no trace of structural differentiation. In a few instances only (Fig. 24) have we seen the empty, spherical, central vacuole noted by Wenyon and O'Connor (1917). In one case two such vacuoles were seen and in a third a small vacuole was seen in the periphery. In a number of cysts the central part may show faint shadows of spheroidal vacuoles and in others the central region is definitely alveolar (Fig. 25) suggestive of the absorption of water and the initial stages of budding or of hyphal outgrowth. In no instance has a definite nucleus been found.

They are never abundant and frequently only a single cyst has been recorded. Their numbers are never greatly increased by concentration methods, and they apparently do not float off in ether-centrifuge concentrations. The nature of their occurrence is such that they appear to represent a widespread but individually sparse infection of the human digestive tract. The possibility that they are undigested spores of adventitious origin from contaminated food or water is not precluded. However, the absence of any instances of heavy contamination seems to militate against such a source.

The systematic relationships of this organism or of these organisms, for there may be several species represented, are wholly problematical. No records of such infections have been found in the literature of the organisms of human or other feces. Their structure is suggestive of a chlamydospore of some phycomycete or the resting phase of some yeast. Isolation and culture are essential to determine their systematic position and affinities.

The suggestion of Flu (1919) that "Iodine Cysts" are degenerative phases of "tetragena" cysts does not appear to be tenable either, for

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"tetragena" or for any other organism, in the sense that either of the organisms included in the concept of "Iodine Cysts" are *per se* degenerative individuals of other species. The large mononucleate *Endamoeba nana*, which constitute the iodophylic group, have normal cytoplasm and nuclei in fresh stools. Evidences of general cytoplasmic deterioration and nuclear disintegration are absent, at least in approximately the proportion of individuals which are normal in other phases of the species. In one case of a stool with excessively large cysts, signs of degeneration appeared in these cysts on standing for three days. The shapes and number of nuclei suggest that the process of encystment has not progressed in these large cysts to the same degree that it has in the smaller cysts of *Endamoeba nana* in the stools at the time discharge. In stained smears individual cysts in various phases of degeneration may be found in all stages of this and other species of *Endamoeba*, but in such instances the degeneration appears to affect many individuals at once in various phases of their cycle, and not merely the larger or the mononucleate stages. In other words there is no evidence that large glycogen-laden cysts of *Endamoeba nana* are degenerating because of these characteristics, though some of them doubtless do degenerate because encystment is not far advanced when the stool is discharged.

The homogeneous cysts likewise show no unmistakable evidence of degeneration. Their optical properties, resistance to stains, and uniformity of structure are apparently those of normal organisms. Their occurrence and distribution are those of a widely distributed but relatively rare organism of the human digestive tract. They were never abundant in any of the 190 instances in which we found them in stools. At the most not more than several cysts were found in a single direct smear. They occurred independently of all the other protist parasites and in nearly all available combinations with them, but without predominance or limitations to indicate that they are a degenerative phase of any one of the organisms with which they are associated.

There is no clinical evidence in cases of pure infections by *Endamoeba nana* or by the homogeneous cysts that they are pathogenic.

SUMMARY

The "Iodine Cysts" of human feces described by Wenyon and O'Connor include two different organisms, namely, the large glycogen-laden, iodophylic, mononucleate cysts of *Endamoeba nana* and the non-nucleated, homogeneous, spore-like cysts of some vegetable organism, possibly the chlamydospore of some phycomycete of unknown affinities.

The nucleated "Iodine Cysts" intergrade in diameter, and in size of the glycogen body with the smaller bi- and quadrinucleate cysts of *Endamoeba nana*. The size of their nuclei is the same as that of the large mononucleate *E. nana*. The location, finer structure, distribution

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of the chromatin, and nuclear membrane of the nuclei of the "Iodine Cysts" are similar to those of *Endamoeba nana.*

The "Iodine Cysts" resemble the cysts of *E. nana* in structural details more than they do those of *Endolimax williamsi* Prowazek, a doubtful species allied to *Endamoeba coli.* Brug's conclusions that they are phases of that species are not sustained. Flu's conclusion that they are degenerate "tetragena" cysts is likewise untenable.

The homogeneous cysts included by Wenyon and O'Connor in their "Iodine Cysts," have no nuclei and only rarely one or more excentric or central, empty, nuclear-like vacuoles. Their cytoplasm is homogeneous, with alveolar vacuolations appearing in some cysts with process-like protrusions of cytoplasm. They range in size from 7 to 30 microns and were found in small numbers in 190 cases in 2,865 stool examinations, or in 7 per cent. They may be the chlamydospores of a phycomycete of unknown relationships.

There is no satisfactory evidence that the "Iodine Cysts" are *per se* degenerative phases of any amoeba or other organism, or that the homogeneous cyst is an adventitious parasite. Both appear in their distribution and occurrence to be normal parasites, but without indications of pathogenicity.

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A LECTURE ON FIELD HOSPITALS

By Colonel BAILEY K. ASHFORD
Medical Corps, United States Army

(*Concluded*)

NOW we come to the *French* army.

We had seen a few of their field ambulances and I am afraid we made a snap shot diagnosis that they were behind the British; we were still under the influence of the English at that time very strongly. The first one who talked about them was Professor Tuffier. Now Professor Tuffier is a very remarkable man and all of us know him by reputation. He is a civil surgeon of a very fine type, speaks English very well by the way; a man who is a very patriotic Frenchman; and at great personal loss he has done much in this war; he has been throughout the war one of the chief—if not the chief—of the consulting heads in the Department of the Service de Santé. Everyone has looked up to him a great deal. He told us that all the field ambulances of the French army used to be known as the *hopitaux de triage*. Gentlemen, I am going to say something here today that is going to be directly contrary to what you have heard some division surgeons advise from their experience in Chateau-Thierry. I don't think there is any question but that the early difficulties of the Medical Department of the French army came largely from their early application of the triage. Now war is a very disorderly sort of thing, and to try to carry it out by any fixed rules, to try to produce ideal conditions at any cost, makes ideally impossible conditions ideally wrong conditions. The French field ambulance was established in the immediate rear of the fighting troops—3 or 4 kilometers, too near to be a field hospital—established there as a triage or sorting place for all the wounded, sick, and gassed sent there to be classified. From that place, of course, these men, being classified, were sent to the various points which were specialized for treatment of certain classes of cases. But what actually happened. If you want to see what actually happened, go to the Val de Grace Museum in Paris and look at that exceedingly fine painting of a triage. It is a work of art, a beautiful thing; and there in the gathering darkness, just about as day was dying, with the wounded lying on stretchers out over the ground in every direction, one or two tense doctors and nurses were going around with lanterns peering into the faces of the men to see what they had. What's the result? It's a block interposed in a main path to the rear without being able to remedy the condition. That's not the way to do triage. The French found that out and stopped it.

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That kind of a triage means this: A man comes in wounded from the front. His battalion surgeon has dressed him and he would know more about him than anybody else, and he should put a diagnosis ofwhat he believes he has on the usual tag. That will do to get the man back to the hospital where he can be treated properly. I have seen diagnoses such as this: "Compound fracture of the femur with probable injury to one of the principal vessels." That's enough. If that man stops anywhere on the way back they will look at it to see if he has been bleeding, but he ought to be sent direct by the battalion surgeon to where he can get proper treatment and that's what the French do today. A formal triage which stops every man and makes him wait until he has been examined or only to have his tag read, without being able to apply a remedy, is courting disaster. Now this is the triage that we don't want to do in the American Army; it is the kind we are starting in to do, but it is a fatal mistake. You shouldn't do triage at any one place; you should do triage at all places but only by reference to his diagnosis tag. Send the man in as fast as you can to get him to some place where he can have something done for him. There is a place where by far the most important triage is done, and that place is the advance surgical hospital for non-transportable cases and that is a field hospital. Tuffier said "make that hospital a 200-bed hospital with one surgeon and four assistants." Certainly 3 or 4 kilometers is too close to the line; it should be 10. Now at these places, of course, you treat shock, hemorrhages, and all that sort of thing. You have to have a radiologist; no reason at all why you shouldn't.

Here are a few notes from General Ruotte. General Ruotte was chief surgeon of the French army at Gallipoli. He says there are two ambulances to a division, two to a corps, and an indeterminate number to an army for reinforcement. The old French ambulance used to be an animal-drawn affair with seven wagons; there were five surgeons, one pharmacist, one administrative officer, eight drivers and thirty-eight enlisted men. That has been found not to be well enough equipped, so they added to it the new surgical automobile ambulance, which is what they call the *auto chir*. You hear of that a great deal and it is known in our army as the mobile hospital unit. They send it up and make of it a modern field hospital, with ten surgeons, ten assistant surgeons, eight nurses, sixteen enlisted men and the consulting surgeon with four surgical sections. They have a portable operating, radiologic and sterilizing outfit, on five trucks. He said that one field ambulance was to be used for the non-transportable wounded and one for the sick and triage.

Some time ago we went up to the 6th Army. This was a very interesting trip because our class had seen the 4th Army and wanted to see the 6th, and the 4th and 6th Armies were the ones the Germans

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broke through a few days after we got out. That was the break which took the boches down to Chateau-Thierry. Beaurieux was one of the prettiest villages I have seen. Very old, quite romantic, fine chateau, and all that sort of thing, and in the basement of that chateau was the field hospital, or rather the field hospital and the advanced surgical hospital. We had a talk with General Laznet, a young man, chief surgeon of the 6th Army; very active; like General Ruotte, always out in front somewhere—that's where we found him. He said his idea was to put one field ambulance per division as a triage as near as possible to the line and incorporate with it an advanced surgical team with equipment. He manned this advanced surgical hospital with the best surgeon he could get, a crew of female nurses, provided it with fifteen to fifty beds, and saved at least some lives. General Laznet was getting down to what is about right. I never saw better outfits than they had. No private hospital in Paris had much of anything on them—spring beds, spotless linen, central heating, electric light and solid comfort. All of this 7 or 8 kilometers from the front.

We went to Vailly. That town was pretty well smashed up, but they had a beautiful hospital in the bowels of the earth—just like Beaurieux and 7 kilometers from the line. From there some of us went to a famous stone quarry where they had one of these field ambulances and an advanced surgical group. This place was quoted as being the ideal advanced surgical hospital, right under the guns of the enemy. It was very near the line, in a quarry with 20-feet protection of solid rock. They had everything they needed; heat, light, and perfect equipment; and while they had only fifteen beds the place would hold an indefinite number of men.

We went back a little further and saw another advance surgical hospital that was in a depression on a height 8 to 10 kilometers from the front. This hospital had a gas quarter and two Bessonneau tents. There was a good resuscitation ward. They kept all gas cases and the non-transportable.

Now, mind you, these were field hospitals, so called; they preserved the name field ambulance, but in reality they were advance evacuation hospitals, and this was the first echelon of the new French scheme of having their evacuation in three lines. They run about 15 kilometers apart. That is the best way—no question about it, it is the best. In the second echelon is the field hospital of the corps, or the evacuation hospital.

We now reached this second echelon Evacuation Hospital, the H. O. E. (*Hôpital Origine Evacuation*) de Corps. This was a large unit holding a thousand. There were four Bessonneau hangars which held 250 gassed and 250 wounded. One hangar was filled with the non-evacuable and there was here an eye and ear department. The rest were housed

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in small Bessonneaus. This was formed by a group of field ambulances of the corps.

We now reached the group of field hospitals for medical cases. This was one of six such groups for the 6th Army and was the chief one. It was well in the rear, in the grounds and buildings of a fine chateau, near Soissons. In fact all their field hospitals for medical cases seemed well in the rear. The chateau buildings were surrounded by Service de Santé barracks. This group was the headquarters of the Consulting Physician of the Army, the Medical Disability Board and the Army Laboratory. In addition, in an isolated section of the grounds, was a hospital for contagious diseases of some 250 beds. It was an army unit, although composed of field ambulances.

On one occasion we visited a group of three French field ambulances for seriously wounded on the Aisne and near the line. It was in a chateau reinforced by many barracks. The part was very attractive and no expense or trouble had been spared to make it thoroughly comfortable and ornate and to provide the soldier with every necessity. It was in command of the Consulting Surgeon of the Army, M. Okinczyc, the exponent of advanced surgical hospitals. This one was shelled at times and on one occasion five surgeons had been killed there outright by one shell. The operating group with its *groupe complémentaire de chirurgie* (our mobile surgical unit) was lodged in barracks, painted white interiorly, with plenty of electric light, ample central heating, city operating room, furniture, etc. There was an elaborate shock room with electric light canvas hoods for warming patients and windows therein through which the patient could be observed and through which an arm could be protruded for transfusion while the heating went on. The radiologic room was complete. They had an X-ray operating table and outfit, with a fluoroscopic operating bonnet, and a perfect sterilization plant. The hospitalization section was neatness, cleanliness and comfort itself—linoleum on the floor, iron bunks well made up, with sheets and blankets, walls painted (they were decorated in all these hospitals), flowers on the table, nurses in attendance. One of the wards was kept for streptococcus cases, all of which were isolated. There was a good pathological and bacteriologic laboratory. There was here a triage and evacuation section. Only seriously wounded were held here as a rule, and it was a true field hospital—the first echelon surgical hospital of the French. By contrast with this excellent group in which the wounded were lodged in chateau and barrack buildings we cite Chalons-sur-Vesle, in many respects the most complete and best administered field hospital group we have ever seen. The site was excellent, in a large chateau in a wooded park, on a good road and only 5 kilometers from the front. Here the patients were housed in tents; the operating equipment in a chateau and in a couple of barracks. This

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operating equipment was a *groupe complementaire de chirurgie* on truck and tractor, and as the operating was done in the chateau the portable operation pavilion was used exclusively for radiology. The electric lighting of the hospital was from this *groupe* and it yielded 150 32-candle-power lights. Here there were three operating rooms and three sterilizing rooms. These were all white enameled, centrally heated, and well equipped. Nine operating teams worked here, each composed of one surgeon, one assistant and three enlisted men. There was a triage here at this hospital and from the receiving rooms operative cases were sent to the pre-operating room or to shock room as indicated. There was one medical officer detached to care for the shock and pre-operating room, and he did nothing else.

The evacuation section was in Bessonneau tents and one Bessonneau hangar and had a capacity of 1,000. It was really extraordinary the amount of equipment they had lavished on these wards and their cleanliness and cheeriness.

There was also a remarkably fine gas quarter here. It had its own triage, and chlorine cases were sent to the wards direct, the mustard gas cases to the bathing pavilion. This bathing and degassing outfit consisted of the following apartments in a partitioned barrack for: (1) Derobing, (2) bathing, (3) alkaline solution to mucous membranes, (4) fresh clothing, (5) history taking, (6) ward.

This field hospital group only took gassed and the severely wounded. Its capacity was from 500 to 1,500 as needed.

Division Medical Field Ambulance.—This was run by M. Collin, a French medical officer who had been for a long time a regimental surgeon under Colonel Thoris, whose work you know, and he had shown us on a previous visit what we shall always remember as the finest regimental station we have seen to date. This hospital was also in a chateau with a large wooded park on a hill which was filled with barrack wards. Its capacity was 300 and it received sick, skin diseases, and the gassed. It, too, was a model of neatness, lavish equipment and furnishings.

Divisional Medical Field Ambulance.—There was a little field hospital, a divisional affair, that was devoted to the treatment of medical cases at Jouaigne. Beautifully situated, it was as pretty a country as I have seen. That hilly country invaded by the Germans is very, very beautiful; and this little hospital was in a chateau in a park, very comfortable, and devoted to medical cases. Its capacity was 400. It was installed in barracks and in the chateau itself. I was told there that they divided their cases into the slightly ill, not to be kept more than six days; the cases of incipient tuberculosis, and into other contagious diseases. I found out that this was the first place to which men suspected of tuberculosis came, and they had a radiologic outfit for medical diagnosis of these cases and heart cases. The tubercular never return to the front.

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The closed cases are sent to work in the rear, somewhere in the base sections, and the open cases are sent to sanatoria. They had a section devoted to the treatment of the ordinary diseases, and the chief ones seen at that time were influenza and its dependent complications. At that time they were having an epidemic of "three-day fever" (influenza) and they had some very serious cases of pneumonia and pleurisy. Near this hospital was a rest station for officers in a large chateau, a perfect beauty, where they had all the comforts of home and a luxurious home at that. We found both English and French here.

The Division Field Ambulances near Pont à Mousson.—One was for slightly wounded and sick and the other for seriously wounded with a *groupe complementaire de chirurgie* attached. The latter was in a large seminary and was most excellent. The other was in barracks. In addition a special army surgical hospital of 320 beds was provided for overflow and serious cases. It was of Service de Santé barracks and was also a good example of comfort and completeness. There was a section of this hospital devoted to the ambrine treatment of the burned.

Group of Field Ambulances for Gassed and Slightly Wounded.—This was in a cantonment area, a rest area. It had a Bessonneau hangar for sitters, a barrack hospital and a complete operating group with sterilizing, radiologic and pre-operating wards.

Field Hospital in Rheims.—This was only 2 kilometers from the German trenches and was sheltered in old wine cellars under a municipal hospital. It accommodated 60 patients, but while excellent in equipment and neatness it was very near the lines and in time of bombardment was cut off. It was a triage and advanced surgical hospital, but the disadvantages of having a triage so near the lines and in an out-of-the-way corner of a ruined city seemed very clear to us. Time was wasted in getting to it that might have been better employed by sending the wounded direct to the rear.

Fracture Hospital.—This was also in a fine chateau on a wooded hill which was well parked and full of flowers. The wounded were in Service de Santé barracks. While every city hospital accommodation was provided under beautiful country surroundings and it was neat, clean and well equipped, it was too far from the line and all cases arrived infected. Its capacity was 400.

Visit to the Chalons Sector.—Here the field hospitals were, as in the 6th Army, frankly grouped as evacuation hospitals. They were, however, still referred to as "field ambulance groups." One, 10 kilometers from the front, was fully immobilized in Service de Santé barracks and had a specially constructed operating group. It was an orderly and complete a barrack hospital as one could wish to see, and a feature of the place was its landscape gardening and comfort, even its luxury. Its capacity was 1,000 and it received the gassed and the severely wounded.

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They had female nurses, the usual triage, an exceptionally good deshocking plant and operating teams.

The last field hospital I have to call your attention to was at Jouchery. This is destined to be a historic site for military and civil surgeons, for it was here in this little barrack hospital that Lemaitre, the father of the primary suture, bravely worked out under surgical conditions, without radiology or bacteriology to help him, in the face of almost insuperable obstacles, the greatest contribution of surgery to war. It should not be forgotten that it was not in a base hospital, nor even a big evacuation hospital, that this great light to surgical practice was kindled. It was in a modest, even poor, little field hospital within gunfire of the enemy, and it was done by a man who was a plain field hospital man who had never advanced any claim to being a great civil surgeon. The hospital, when we visited it, was a tiny affair compared to the splendid big institution we had just seen. It was complete and neat, of wooden barracks on three sides of a court, in the center of which was a Bessonneau tent for the triage, dressing room, pre-operating room, and shock room. At this date all of the progress of military surgery was represented—a radiologic room, bacteriological laboratory, etc., but it reminded me of a toy hospital. It bespoke its poverty, but it was clean, cheery and ornate. I was accompanied by Lemaitre himself, who, though promoted to a professorship in the French Medical School with a huge operating clinic at the H. O. E. of Bouleuse, preserved for it an affection and enthusiasm which was very touching. He exclaimed as we approached, "That is the ideal. Give me a little place like this and my devoted little band of assistants that stuck loyally to me all through the early days of the primary suture, and, all alone off here, I can do more than if I had the biggest institution in the French Army." There was something very human about this that appealed strongly to me. The big things are often done in these small, poorly equipped places.

At that time M. Okinczyc was in command. He had been transferred here from the hospital where we had first seen him. The personnel was 5 medical officers, 1 radiologist, 1 administrator, 1 pharmacist, 42 enlisted men, and 15 drivers. No feature of an evacuation hospital was missing; its capacity was 400. There were two operating rooms. The slightly wounded are classified here as donors for transfusion, but, with this exception only, the seriously wounded are brought here.

Major Okinczyc assembled our student officers in the receiving tent and gave us a short talk on the work of a field hospital in war. It was short, but I believe that it synthetized all that can be laid down as doctrine for the surgical use of field hospitals from the professional standpoint. The field hospital should be primarily for the treatment

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of the non-transportable—that is to say, for those who cannot be moved further without endangering their lives or seriously aggravating their condition. Such are:

1. Those suffering from or in danger of a recurrence of hemorrhage, requiring ligature or transfusion or both. No man should ever be evacuated to the rear from a field ambulance with a tourniquet on.

2. Those with chest or abdominal injuries.

3. All cases of shock.

4. Certain compound fractures, especially of the thigh, all of which should be here stopped, carefully examined as to shock and their splinting and only sent on when it seems safe to do so.

At these hospitals one cannot expect to get through without losing at least 30 per cent of the wounded. This brings down the mortality of the evacuation hospital and takes a tremendous load off their operating staff, as they have to spend so much more time on such cases. Besides, as he rightly says, the non-transportable are non-evacuable also and would have to be held at the evacuation hospital anyway. They are also popular with regimental surgeons, who, in the confusion and hurry of the front, are unable to handle these desperate cases and unwilling to expose them to a long trip.

. . . . . .

Now, gentlemen, we are ready to apply what we have seen; these things that I have cited are facts that we needed before we could really discuss what we are going to do with our own field hospitals. Take our field hospitals as they are. They are not equipped for this war, but they are being equipped. There are some who think that the field hospital should be a divisional unit and should be looked to to do emergency surgery at the front, and there are many very excellent men here and in the United States—natural leaders in the States in surgery—who say that we divisional people should not be entrusted with the surgical care of the wounded. True, this sentiment is not expressed as plainly as that, but it is there. But what are the facts? Are they right about it that we are not equipped—that we have not the experience as a class of men? They may be. Some of us, individually, may be very fine surgeons; but, in general, the general practitioner is not equipped to do the delicate work on these desperately wounded men. It is naturally right and proper that some experience be required of those who are to do this kind of work—that is to say, it is the business of an operating team, or more than one team, at these field hospitals; and it should not be resented by us that we should be required to show our fitness for this delicate surgical work. But let us answer them, as we all will, that we will learn their game; that we are going to fit ourselves to carry on at a field hospital; that we will learn how to do this work from their leaders,

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through teams. That's the whole question and that is the idea of this school. Surgeons are none too plentiful as it is. I know of one division that organized five teams from their own personnel and had to lend three of them to evacuation hospitals in their rear. We are endeavoring to bring together the base people and the front people, that we may get good coöperation. All the men at the front were at first looked upon in all armies as men capable of handling only emergency surgery that anyone might do, and the men at the front strafed the men at the rear because they said they didn't know anything about the war. And in a way they were both right. We are trying to break that down by bringing these elements into contact, the men at the base and the men at the front, and when we do it we will have a medical corps that is ideal.

These ideas on the field hospital are personal, collected from what we have seen in the course of a year and a half in France. But I believe this is the solution of the problem. If I didn't believe it I wouldn't give it to a class of medical officers. We have four field hospitals. I believe two should be surgical hospitals, one a gas hospital, which, when not receiving gas cases will be receiving men who have become tired out, as a rest station, and the last should be a medical hospital, which will take in not only the current sick but which should have some control over the venereal labor camp, and the hospitals or wards for contagious and skin diseases. If you will look at it in the following way you will understand: Up to the present time, in the fifty-two weeks of the year, fifty weeks are spent in inactivity and two weeks in activity. We should bear in mind that our men should be made comfortable in at least those fifty weeks if in quiet sectors and periods of inactivity. Conditions approximating civil ones should prevail under these circumstances wherever possible. We should try to meet the conditions and endeavor to keep men at the front, make them comfortable and keep them from getting lost by being sent back to the rear. The field hospital should be so equipped and so supplied that it should be able to go with its division at a moment's notice, to take part in an advance or retreat, and, when it is stationary, to take care of the sick, wounded and gassed men to the best possible advantage, and with the proper men and the proper staff it will do it. They are ordinarily immobilized, but when movement comes they should be allowed to cut loose and go ahead. There is only one way to do that and that is to have the correct medical service organization. There should be under the corps surgeon an advance medical supply depot which should be a receptacle to take care of all stuff of the field hospital which has become immobilized, and which should store it and keep it against the day when it becomes again immobilized. Or, when such a thing is feasible, the corps field hospital might come up and take over the hospital which they have immobilized and work it as an evacuation

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hospital, allowing the field hospital to go on. The field hospital thus loses none of the dignity of its position, but becomes more important than it ever was and is not confronted with the impossible task of caring for all wounded.

Now to get down to bare facts. Our tents are absolutely improper, inadequate for this war. The Bessonneau tent is so far ahead of our tent that there is no comparison; there is no question about it. The double-walled tent is a warm tent; the single-walled tent is a hot tent in summer, and a mighty cold one in cold weather. The Dixon is a wider tent than the Bessonneau; otherwise they are about the same. They are built on the cantilever bridge style, one portion supporting another. One could be used very well in time of activity as a triage and an office, and this is where they take the wounded. Why have a dinky little office somewhere else when office work is practically limited in battle to this tent—unless you become immobilized. Another should be used for the pre-operating tent where men may be washed up and prepared for operation, deshocked, and transfused if necessary. The other ten tents are wards. In addition to that we have certain other tents. I am going to give you the equipment for these surgical hospitals when they are immobilized and then tell you what things are to be left behind when the field hospital goes into action. Plus the above-mentioned tents you should have one large ward tent, old type, for stores; that's the way to use up the old tentage. Another similar ward tent should be provided for a dining room; you should not require the corps men to eat out in the open, and there should be a plain hospital tent for a kitchen and one for kitchen stores. The kitchen should be under cover; the kitchen stores should be separated from other hospital stores, of course. And you should have ten pyramidal tents for your men. It is perhaps true that they *will* hold 15 or 16 men, but, as a matter of fact, that tent will not hold more than 8 or 10 comfortably. You should have seven wall tents for your officers because you will have more officers in this new surgical hospital than our manual calls for. Our manual calls for 6 officers to a field hospital; one, the major, has a tent to himself. But to that number of officers you should add those of one or more operating teams. On your operating teams we will have one female anesthetist and one female assistant; we are probably not going to have male assistants to operators. These two girls will have to be put in a tent. Then there is the medical officer of a resuscitation team. These resuscitation teams are extremely important. They do nearly as much good as an operating team and they are fully as indispensable. There should be one radiologist and one bacteriologist with the mobile outfit. It is foolish to say you can't use a mobile bacteriological laboratory at the front—you can. The following dependencies are noted *only when the hospital is immobilized*: A carpenter shop; a

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machine shop with a "smithy"; a tailor shop to keep your men neat and looking well; a cobbler shop to keep your men well shod; a barber shop; a canteen, and, separate from it, a recreation hut, which should be furnished by the Red Cross; a bath; a delousing plant; and an office, because when you settle down and are immobilized you want a separate office outside the triage, which is a very noisy place for a steady diet; a laboratory; a feces and garbage incinerator, with a bucket latrine and a pack store, where you take up your equipment and keep it. This may seem like a lot for a field hospital, but if you haven't a lot of these things your men are not going to be comfortable in the dreary days of inactivity, as comfortable as you can make them; and these things are furnished universally by the British, as I have seen them. They do it, and the French do it too, and we have got to do it. We are not doing it anywhere near enough, and we have got to do it.

Now *in inactivity*—I am talking about when we are not attacking or being attacked—such a place can be kept up as a regular place for the field hospital when the division has taken a certain position, a certain sector; and until that position is changed it should be kept right up, and the corps should keep it up. When the field hospital goes out it takes with it its combat equipment and the outfit replacing it takes the rest of it over and it becomes the property of the next man. A field hospital settles down in a little town, in cellars or perhaps a chateau where you can accommodate lots of these dependencies or the operating equipment and you won't have to use all your tents. Generally, however, you have to use your Bessonneau tent, your admission tent, and your preoperation tent, and as many ward tents as may be needed to house your patients after houses or barracks are occupied. During inactivity, the post medical supply should be requisitioned—I am saying this advisedly, and I am probably going to bring on a storm of disapproval by it. There are plenty of men who say that is theory; that this is war and you are not back in "posts." I am not thinking about "post" life at all; I am thinking about what I have seen in war myself. They have these things in the French and the British armies, and the men are more comfortable by reason thereof. You find them sleeping in iron bunks with sheets and pillow cases; and you will find there everything a well-regulated hospital should have, and there is no reason why you shouldn't, as long as things are quiet. The whole supply for a field hospital will have to be revised; it is being revised right now. We have a great many things we don't need and there are a great many things we will have to have. As it is now we have a field hospital per our Manual of the Medical Department that, if taken into the field with the name field hospital attached to it, we are not going to do for our soldiers the things we ought to do for them; we are not supplying to the soldier what he has the right to expect when he is in hospital. They are not hospitals; they are merely

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temporary shelters, with dressing station equipment, and we have got to supply a very different sort of thing for the future. Where everything heretofore has been sacrificed to mobility we have got to make a distinction between those things which we will leave behind in a move until things are quiet, and our absolute needs to provide an emergency hospital of modern type in the field of battle.

Another thing. This is the hospital where the Red Cross should be allowed to help furnish. They can furnish a lot of things that we can get in no other way, and every one would make a soldier better off. Do you remember what Colonel Crile said about the predisposing causes of shock? Cold, lack of comfort, that little by little take away the soldier's percentage of safety. And you have the answer right there. These Red Cross people should be allowed to furnish wicker chairs, games, all kinds of medical comforts,including commissary stuff; they should be allowed to decorate wards, to paint, to whitewash, to provide tables, writing materials, magazines, books, tennis balls and rackets, footballs, baseballs, bats, physical-culture men, if you want them, for that period of inactivity. Now when the field hospital is ordered to the front in an advance,the corps medical supply depot or the army can take over all that property not possible to carry and hold it for the unit. In fact the best way is to have a corps or army field hospital move into and run it as a stationary hospital. It might be possible to simply put a guard over it. A triage tent, a pre-operating tent, and twelve Bessonneaus should go with the field hospital into combat. They should go on the same principle that you would transport a heavy gun, and if this augmented equipment is lost it should be viewed in the same light as the loss of big guns. You have to have the gun to kill boches, and you have to have your equipment to take care of wounded men so you can fix them up and get them promptly into shape to kill more boches. Your mobile surgical unit, with its equipment and, of course, your operating team goes, and your resuscitation team goes, and your personnel goes. Then you should carry on with you all those things that you know you are going to need in that battle, and somebody has got to sit down and say what should be carried forward and what should not go. For instance, you should carry gauze and cotton and Thomas splints up with you, but you needn't carry any atomizers up with you. Any of you nose and throat men know that while it might perhaps do some good it doesn't do enough good to warrant loading yourselves down with such things. Lots of medicines need not go.

We have got to have more of certain things; more and better instruments—no question about that part of it. We ought to have portable deshocking apparatus, and a number of other things we haven't today. That goes forward on the trucks that you have. You get to the place where you are going and you unload. You are going to use these trucks

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perhaps for the transportation of wounded. You don't know how long you are going to be there. The other surgical hospital behind you eventually moves ahead of you when the advance takes place. When there is such an advance the one behind moves ahead and jumps over the one in front of it and establishes itself in front in the same relative position to the fighting troops as the first one had. Then it opens and takes the wounded coming to the rear off the hands of the first. The wounded in the first hospital being evacuated to the evacuation hospital, that hospital in the rear then moves forward to a point in front of the field hospital which preceded it, leap-frog fashion. This tandem work has been tried out in the 32d Division and has given good satisfaction in the second Battle of the Marne. It seems to be a very sensible proposition. In retreat the process is reversed. Now, when stationary warfare comes on again you can build about you with the aid of the corps surgeon the things you left behind when you were inactive.

In a war of movement the surgical hospital farthest to the front should conduct the whole triage with a seperate department therefor. If your corps surgeon or your division surgeon insists on triage at one place, this is the place to do it. The triage should never be done where you cannot apply the remedy to the cases that desperately need it. Otherwise it is an utter loss of time and a destruction of that man's limit of safety by exposing him to cold, to fear, and to chill. The cases that should always be detained this advance surgical hospital are chest cases, abdominal cases—chest cases will die if you send them back with open wounds—severe compound fractures, shock and hemorrhage. That is taken directly from M. Okinczyc's estimate of what this hospital ought to be used for. Here is one of the great arguments for this place: You never have assurance that you can get to the casualty clearing station, to the evacuation hospital, because as we have seen in this last push they are left far behind over crowded roads, with scanty transportation to get at them, and desperately wounded men at the front are utterly deprived of the proper sort of help. You have got to provide for that on the way back.

Now we come to the gas hospital. The gas hospital is rapidly taking form under the excellent administration of Colonel Gilchrist. He has an outfit, a portable degassing outfit. There are two of them to a division. It consists of a large 1,200-gallon tank of water, which is really a portable bath, and all the material necessary to do the bathing and degassing of these patients. Therefore the gas hospital should contain ten Bessonneau tents for the accommodation of your patients, 300 by crowding them in on litters—you are not taking beds with you this time; one large old-type ward tent for stores—got to have that; one for a dining room; one hospital tent for kitchen and one for kitchen stores; ten pyramidal tents for men, and six more tents for officers and nurses.

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You may have to cut some of that tentage down, especially that for personnel, but you should hang on to your ward tents and receiving tent to do triage in, and the portable degassing outfit. Now when you get settled and things quiet down, that becomes a place where you can send men from time to time for rest, and as a rest station this field hospital should take on all the characteristics we have described for the others, with its cobbler shop, carpenter shop, etc. The number of men is the same, and the Red Cross here should be especially active to provide recreation games, theatricals, music, comforts, etc. In regard to gas, remember what happened in the 26th Division—that only 10 to 15 per cent of the people supposed to be gassed really were, and the rest were only exhausted, mentally and physically. You see the gas hospital is the natural place to have a rest station, and a rest station in the strict sense of the word.

Now we come to the medical hospital. They should have eleven Bessonneau tents—one for triage and the rest for wards; one for kitchen, one for stores, ten tents for the men and six for the officers. Same as the outfit for the gas hospital and the surgical hospital minus the degassing outfit and the surgical equipment, but it should include baths and be equipped to run skin and venereal wards. You can delouse these skin patients, but you want them separated from the others if you can. The medical hospital should have its division consulting physician, and the gas officer should have his headquarters here at the gas hospital. In that way you have within the division the head of the evacuation system offering real hospital conditions of a temporary emergency nature to men desperately needing it and who can get it only with great difficulty otherwise. I believe that is the situation as far as we can develop it in our army today in France. I don't believe all of these things are going to be carried out because I am sure somebody will develop much better ideas than I have, but I believe in general the plan should be followed because it seems to me to be built on facts in this war, and it seems to me to be something which the conditions imperatively demand.

That finishes the consideration of the field hospital as far as I am able to give it to you, but one thing should be made very plain: Whenever nearness to the line, good roads, and a quiet sector permit, practically all wounded should go direct to the evacuation hospital where the triage can be made. To stop a man on the way there is never an ideal; it should be only done in time of stress. Just as an evacuation hospital in a push cannot operate on slightly wounded as a rule, which they send to the stationary hospital in their rear, so the desperately wounded when the roads are clogged should be taken care of farther to the front, and here the triage must be done to prevent them from being carted to the wrong place or dumped in a confused heap on an overworked central

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hospital, such as the evacuation hospital comes to be. In fact in a war of movement and severe operations from intrenched positions triage is necessary, but it must not be done as it has been done. It needs an experienced officer of the best type to facilitate and not hinder the prompt delivery of the patient to his final destination for definite treatment. The full 90 per cent of slightly wounded can be sent clear to general hospital 150 kilometers in the rear, suffer there, from twenty-four to thirty-six hours thereafter, a surgical removal of devitalized tissue and the foreign body and a closure by retarded suture from three to five days thereafter, and their wounds will heal by primary intention, but to relieve evacuation hospitals of these cases needs a good triage officer to make it a success.

REMEMBER THE OCTOBER MEETING AT ST. LOUIS, MISSOURI, FROM THE 13th to 15th OF THE MONTH

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PROBLEMS IN THE CONTROL OF INFECTIOUS DISEASES AT REPLACEMENT DEPOTS

By Colonel O. G. BROWN
Medical Corps, United States Army

AT LARGE replacement depots, in time of war, the problems encountered in the control of contagious diseases were new and unusual. Owing to the unprecedented requirements, old systems of control served as little more than a basis upon which to build a new system which would meet the altered conditions. The population of the camps was constantly changing. Exposure to infectious diseases was general. Men had to be considered by thousands rather than by individuals. It was of paramount importance that medical and sanitary work be accomplished in such a manner as not to seriously interfere with the military machinery of the movement of troops.

Representatives of the Bureau of Laboratories and Infectious Diseases were always available to proceed to camps as their services were needed, to assist in the examination of cases of infectious disease and to advise in problems of isolation and quarantine.

The principal replacement camp of the American Expeditionary Forces was the First Replacement Depot, located at St. Aignan sur Cher. The function of this depot was to operate as a source of supply for the replacement of men lost in action or through other casualties throughout the A. E. F. Most of the troops at the First Replacement Depot came directly from the mobilization camps in the United States. A smaller number were patients discharged as cured from American military hospitals in France.

At the replacement depot the men were examined physically, fully equipped for field service, and, if time permitted, were given a brief period of military training before being sent to the front. At the height of military operations the rate of flow through the camp was about 100,000 a month. The stay of a soldier at the depot varied from a few days to several weeks.

The depot was divided into two parts, first, a classification or receiving center, and second, holding camps where the men were quartered until such time as they could be evacuated. Large, well-equipped hospitals were provided for the care of the sick.

Upon the arrival of the troops at the depot, there were, as was to have been expected, many cases of infectious disease among them. The conditions under which the troops had been mobilized and transported were such as to favor the spread of infections. The men had been

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gathered from all sections of the country and concentrated in large mobilization camps in the United States. All were young, and consequently peculiarly susceptible to infections. From the concentration camps they were transferred to crowded ships. Large numbers had to sleep together in congested quarters below deck. The ventilation was necessarily poor. Portholes could not be opened, as the ships had to be kept darkened to avoid submarine attack. Although all precautions had been taken to prevent the transportation of infected men it was inevitable that some of them should develop infection on board ship. Under these conditions the kindlings were laid, ready for the match to start the conflagration. One case of measles was enough to start an epidemic on shipboard. Isolation was a matter of extreme difficulty and, in the presence of a large number of cases, was frequently impossible.

From the ships the men were rapidly entrained and further transported in box cars. At the base ports infected men and their contacts had been removed, as far as it was possible to do so, but there necessarily remained numerous foci of infection among the men entrained.

It is not surprising that, upon the arrival of troops at the First Replacement Depot, every increment brought with it cases of measles, mumps, cerebrospinal meningitis and almost every other disease known to man.

At St. Aignan the control of infectious diseases divided itself into two parts: first, the segregation and weeding out of the men already infected and, second, the isolation and treatment of the contacts, to prevent further spread of infection.

Medical officers met all trains. New arrivals were lined up and given a rapid medical examination before being sent to their quarters at the classification camp. This examination was necessarily hurried. Its object was to pick out the men manifestly sick, who needed hospitalization. The following day the men were all given baths and were required to pass naked before a board of medical examiners, at which time a more critical and minute physical examination was given. Men in whom defects were discovered, and who required careful examination, were immediately sent into a separate room, where they were carefully inspected by a board of specialists. On this board there was a neurologist, urologist, orthopedist, and a specialist in internal medicine. The men who were found physically fit were permitted to proceed to their quarters. The sick were sent to hospital. Contacts were investigated.

It soon became apparent that wholesale quarantine, for prolonged periods, could not be established for the large groups of men. The exposure to infection had been so general, that to establish wholesale quarantine would have necessitated the keeping of tens of thousands of men at St. Aignan for weeks at a time, and would have held up military

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operations, as these men were urgently needed at the front. Moreover, efficient quarantine was difficult, as the men were billeted throughout large areas, and frequently lived in houses occupied by civilian families. It was impossible to keep quarantined men so placed from coming into contact with outsiders. Frequently less disease would be developed in the quarantined groups than among those outside quarantine.

To meet these conditions a system of compromise had to be adopted. Contacts were divided into two classes: immediate contacts and remote contacts. Immediate contacts included the men who slept close by the infected cases, sat beside them at table, or were their close friends or "buddies." Remote contacts included the men who were in the same company or had traveled on the same train with infected men. In nearly all cases only the immediate contacts were isolated. Remote contacts were disregarded, except in the case of the virulent infections.

As extensive quarantine within the classification camp had proved impracticable, it was discontinued. All cases of infectious disease and their immediate contacts were sent to the hospital for observation and treatment, immediately upon their detection. An exception to this rule was made in the case of influenza. This epidemic was so widespread and entailed so great a mortality that the remote contacts as well as immediate contacts were segregated and carefully watched. Contacts were placed in detached groups of buildings at the classification camp, where they were examined twice daily by medical officers, temperatures being taken at each examination.

The control of diphtheria, measles, mumps, meningitis, typhoid fever and influenza will be described in detail, as they demanded special attention on account of their frequency and virulence.

Diphtheria.—Cases of suspected diphtheria and their immediate contacts were sent to the hospital immediately upon their detection. Those showing positive cultures were kept under observation until three successive cultures, taken a week apart, were reported as negative. Contacts having negative cultures were not detained.

Shick tests were made of entire organizations in which two or more cases had occurred at about the same time. Men showing positive reactions were held under close observation for the period of incubation. Their temperatures were taken and throats examined daily.

Measles.—Special attention was paid to measles in view of the possible complication of pneumonia. Measles cases and their immediate contacts were sent to hospital, the contacts being kept under observation there for the period of incubation.

Mumps.—Patients having mumps were sent to hospital and were kept there for a period of not less than twenty-one days. Contacts were not detained, as the disease is not dangerous to life, and the cases were no numerous and the incubation period so long that an undue amount of hospitalization would have been required for their isolation.

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Meningitis.—On account of its high mortality very stringent measures were at first employed in the quarantine against this disease. Entire companies and battalions were isolated under guard upon the appearance of a single case of meningitis within the command. No one was allowed to enter or leave the quarantined area without special permission from the division commander. Men in quarantine were required to spray the nose and throat three times daily with Dakin solution. This rigid quarantine was found difficult to maintain. The results were not satisfactory. Sporadic cases of meningitis were of frequent occurrence. Wholesale quarantine was soon discontinued. Instead, immediate contacts were promptly evacuated to the hospital, where cultures were taken from their throats, in order to determine whether or not they required detention. Positive cases were kept under close surveillance in hospital wards.

Typhoid Fever.—At St. Aignan the outbreak of typhoid fever was limited to one replacement organization. In that organization about forty cases were detected within a few days of each other. They had all come from the same mobilization camp in the United States. The infection was particularly severe. Eight or ten died. Perforations occurred in three cases, all of which were operated upon and made subsequent recovery. Typhoid cases and their contacts were isolated in hospital. The stools and urine of contacts and all men working about kitchens and mess halls were examined in an effort to locate carriers. None were found. Cases were kept in hospital after their recovery until four examinations of stools and urine, made a week apart, were reported negative. The epidemic was studied by the Bureau of Laboratories.

It was found that many cases of typhoid had occurred in the camp in the United States from which the affected men at St. Aignan had come. It was shown that the men had been exposed to a gross infection and it was believed that the epidemic was due rather to the overwhelming infection than to failures in the administration of typhoid vaccine.

An epidemic of typhoid fever at another camp in France came under the observation of the writer. At that camp, six or eight cases of typhoid or paratyphoid a day were reported at the height of the epidemic. The command had just been brought back from the front into a rest area. Both at the front and in the rest area the drinking water was open to suspicion. In the rest area typhoid fever was known to be prevalent among the civilian population. Some of the cases had developed infection at the front and some in the rest area.

Some disagreement existed as to whether the disease had been disseminated by carriers or through the drinking water. Both were regarded as possible sources and protective measures were established on that basis.

Every man in the organization was examined daily by a physician.

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All complaining of slight indisposition were carefully watched. Men having fevers of undetermined origin were isolated in hospitals. Stools and urine of contacts and suspicious cases were examined. The entire command was reinoculated against typhoid fever. The stools and urine of men working about kitchens were examined. No changes of kitchen personnel were permitted during the epidemic.

An extensive campaign for the protection of the drinking water was inaugurated. Numerous Lyster bags containing chlorinated water were placed conveniently to kitchens, mess halls and billets. The drinking of unchlorinated water was punished by court-martial proceedings. Guards patrolled the streams and were posted at hydrants and water taps to prevent the unauthorized use of water from those sources. Placards were posted throughout the town, and expecially at sources of water supply, prohibiting the drinking of unchlorinated water. As soon as this water discipline had been thoroughly organized a sudden drop occurred in the number of cases of typhoid fever. After two weeks of its enforcement no new cases occurred.

Influenza.—The epidemic of the so-called "Spanish flu" reached St. Aignan through replacements from the United States. The sickness and death from this cause, for a time, equalled the rate from typhoid fever in armies prior to the days of protective inoculation. The deaths, for a time, numbered twenty or more a day.

Unusual precautions were taken in handling these cases. Contacts, immediate and remote, were placed in a separate part of the camp and isolated there for ten days. Each man in quarantine was examined twice daily by a physician. The slightly sick were immediately evacuated to the hospital. A floor space of forty square feet per man was insisted upon. When space was not available in barracks, men were placed in pup tents. To prevent men coughing in each other's faces at night, the men sleeping beside each other were required to lie in opposite directions, so that the head of each man was opposite the feet of his neighbor on either side. Officers of the day were required to inspect sleeping quarters at night to enforce these instructions and to see that maximum ventilation was being maintained by keeping doors and windows open. In companies where the "flu" was especially prevalent, all men were required to wear masks. It is believed that the most useful factor in the control of this epidemic was the prompt removal of infected men upon their showing the first symptoms of the disease.

Of the influenza cases, nearly one-third developed pneumonia. The mortality of the pneumonia cases ranged from 20 to 45 per cent, at different stages of the epidemic.

In the control of infectious diseases at the First Replacement Depot the ideal had to be subordinated to the practical. Time-honored principles and procedures suffered violence in the process, but events showed

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that St. Aignan fulfilled its functions as a strainer without unduly retarding the stream of replacements which passed through it. The number of acute infectious diseases at the front was always negligible. The number of cases at the mobilization camps and base ports, from which replacements were drawn, was uniformly high. There were never more than two hundred men in quarantine or two thousand in hospital at St. Aignan at a time, although the troops passing through the depot sometimes numbered four thousand a day.

REMEMBER THE ANNUAL MEETING IN ST. LOUIS, MISSOURI, FROM OCTOBER 13th to 15th.

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GAS WARFARE—ITS AFTERMATH

By Major JOSEPH CATTON[1]
Medical Corps, United States Army

IMMEDIATELY following the introduction of gas warfare in 1915, clinical and experimental research was instituted looking toward the nature of the gases, their lesions, and the indicated therapy.

The subject matter of this communication is derived from available medical journals; the memoranda, communications and atlases published under the direction of the American and the Allied governments; certain captured German documents; a study of some 1,500 gas cases, during October, November and December, 1918, in Base Hospital 64 A. E. F., and studies of gassed cases at a later date in other hospitals in France.

Various gases have been used as weapons. The list includes hydrocyanic acid and sulphur dioxide. Benzyl bromide was used as a lacrymator. Although probably not used intentionally for that purpose, nitric peroxide, from high explosives, has caused some casualties; likewise carbon monoxide from imperfect combustion, close quarters, burning buildings and mining operations, have caused damage. The gases most used have been: (*a*) The suffocant gasses, including phosgene ($COCl_2$), diphosgene, chlorine and chloropicrin; (*b*) the vesicant gas, variously called mustard gas, yperite or Yellow Cross, and whose formula is di-chlor-ethyl-sulphide $(C_2H_4Cl)_2S$. Latterly the two mainly used gases were phosgene and mustard.

Gasses were first sent over in clouds from cylinders, but very soon they were distributed by gas shells and gas bombs. The suffocants produce their lesions through being inhaled. Mustard gas may affect by its inhalation in the finely divided state as a vapor, or by contact with it, in the oily state. The oil may cling to ammunition and clothing. Hospital attendants, as far back as in a base hospital, have received burns from using salvaged clothing of gassed patients five days after exposure. Food, or water from shell holes or wells, may be gassed, and even after several weeks, when taken into the gastrointestinal tract, may cause symptoms.

This communication concerns itself especially with the conditions which may be looked for in the thousands of soldiers returning to civilian life, who will include in their medical histories, "Yes, I was gassed." It is necessary, however, to consider the initial pathology and symptomo-

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tology of gas cases in order more clearly to understand the possible aftermath.

PATHOLOGY

Suffocant Gases.—These gases are pulmonary irritants. Phosgene, ($COCl_2$), was probably the most commonly used gas of this type. In three to twelve hours after exposure, it causes an outpouring, sometimes of an enormous quantity, of fluid into the alveoli and bronchioles, and later into the lung tissue. Coincidently, there develops an acute inflammatory reaction throughout the entire lung. The capillaries are congested and are compressed by the edema; there is a great tendency towards thrombosis in the smaller vessels. The lymphatic spaces are gorged and lymph drainage may not keep up with lymph production. As these processes become further advanced and violent fits of coughing set in, there is some destruction of the alveolar epithelium and bursting of air vesicles, a disruptive emphysema. At the same time, the blood is becoming concentrated and viscosity increases; an initial transitory oligemia is followed by a polycythemia and an increase in the percentage of hemoglobin. The edema; capillary congestion, compression and thromboses; and the slowed flow of thickened blood through the lung, all contribute to a state of oxygen deficiency. With this oxygen deficiency there come temporary and probably, at times, permanent changes in various systems, especially the central nervous system. While the actual oxygen content of the blood may not always be diminished there is, in these cases, evidence of local or more general deficiency in oxidative processes in various organs and tissues. The pathology in the lungs leads sooner or later to more or less failure of the right heart, and the latter in turn to greater oxygen deficiency. The failing circulation may be accompanied by acidosis.

The only other pathology attributed to phosgene has been that seen in the blood vessels. Thromboses have been found in the smaller vessels of the lungs, kidneys, stomach mucosa, the brain and the extremities. Gangrene may supervene in the extremities. Larger thromboses have been found in the heart. There have been petechial hemorrhages on the surfaces of the lungs and heart, on the inner side of the cardiac stomach, and in the brain; there have been larger hemorrhages into the brain. In addition to the thromboses and petechial hemorrhages, the stomach has shown larger hemorrhages filling the organ-superficial ulcerations and in some cases marked extension of these ulcerations.

The evidence to date would indicate that phosgene, as such, is not absorbed and that the lung is probably its sole seat of action. The mechanism of thrombus formation in these cases is not clear. The circulatory failure and thickened blood may be factors in any of the thrombi; the slowed blood stream in the lungs may be a factor in the thrombi

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there. Bronchitis or lobar or broncho-pneumonia may supervene; the pneumonias, however, are not common. The effects of gas differ from those of infection of the respiratory tract; gas does more damage to the lung parenchyma, affects the lung more universally, and causes *per se* no systemic poisoning.

Vesicant Gases.—Mustard gas acts in an entirely different manner. Some hours pass before pathology is apparent. In contrast to phosgene poisoning in which it appears, the main seat of election is the respiratory tract; mustard gas affects almost every tissue with which it comes in contact. The common sites of pathology are the conjuctivæ, the skin, the upper respiratory tract, and the pharynx.

The eyes may show slight degeneration of the corneal and conjunctival epithelium and simple conjunctivitis, or more or less complete necrosis of the corneal vertex extending through its entire depth. In more severe cases there may be iritis or irido-cyclitis, necrosis of the conjunctival epithelium or panopthalmitis.

The skin affected is over the exposed portions such as the hands, the skin around the borders of the respirator, and the sweaty places—the axillæ, flexure of the elbows, the groins and perineum. The lesions are erythema, blisters and sometimes deep burns. Usually pigmentation and desquamation follow, and cicatrices if the lesions have been deep.

The pharynx is usually only injected, but in the severe cases it may ulcerate.

The lesions of the respiratory tract are very different from those of phosgene. Mustard gas attacks primarily the larger tubes, while phosgene attacks the entire lining, including that of the alveoli. Rather than calling out a great edema, mustard gas actually burns the respiratory lining, and there occur necrosis, ulceration and sloughing. Secondary infection of these lesions always supervenes. It is not the rule in this type of poisoning to see the marked interference with aeration or the consequent changes in the nervous system and other systems. There is, however, a limited number of cases with sufficient pulmonary lesions to bring about these conditions. There is evidence of increase in blood urea, of diminution in the total amount of urine and of chloride and urea excretion, and of increase in the specific gravity and acidity of the urine.

PATHOLOGICAL PHYSIOLOGY

Phosgene.—So much for anatomical pathology. In addition to the structural changes found in phosgene cases, there are marked changes from normal, in various physiological processes. There is much evidence of initial disturbance in the bulbar centers associated with the automatic nervous sytem, especially the vasomotor, respiratory, cardio-augmentor and cardio-inhibitory centers. The lesions of these centers

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appear not to be due to the direct action of absorbed gas, nor to impulses coming up the vagus, but rather to deficient oxidative processes and in some measure possibly to absorption of toxic products from the lungs. As a result of these disturbances there are seen shallow breathing, lack of increase in depth of respirations to compensate for decrease in rate in recumbent position, a tendency toward disturbed tone in the bronchial musculature, rapid heart, vasomotor disturbances, etc. There is evidence that the nervous changes and the consequent interference with oxidative processes may be more or less permanent. For example, it has been found that gassed cases, months after exposure, may still have many of the early symptoms and signs; that they cannot tolerate a lowering of atmospheric pressure below an equivalent of an altitude of 5,000 feet, although such a change does not bother a normal individual. In mountain sickness, too, there is a disturbance in oxidative processes, due in this case to lowered oxygen pressure. Here, however, the changes of a compensatory nature usually take place quickly; in the acute and overwhelming attack made by gas, attempts at adaptation may fail and there occur the changes described.

EARLY CLINICAL PICTURES IN GAS CASES

Phosgene.—It has been indicated that the pathology of the lung irritants does not develop in marked degree, for some minutes at the very least, and that usually there is a delay of from three to twelve hours. Accordingly, aside from an irritation and watering of the eyes, a slight anorexia, and an unpleasant taste for tobacco smoke immediately following the inhalation of the gas, there may be no symptoms until there have come the edema, capillary obstruction, secondary oxygen deficiency and cardiac embarrassment. Then there are seen the catching breath, choking sensations, tight chest, and inability to take a deep breath. Later comes cough with more or less expectoration, and maybe vomiting. Whether the vomiting is central or due to impulses over the vagus or to the gastric pathology already mentioned is not clear. At this time examination shows all the signs of lung edema and congestion, and sometimes there are mental findings such as disorientation. If the case is severe, to these symptoms and signs are added those representing the more pronounced pathology, and there are two great classes of these cases.

(*a*) *The Blue Case.*—If the circulatory apparatus is functioning well, there is seen a patient, cyanotic, with turgid congested face and neck and distended superficial veins. Dyspnea is marked, but the breathing fairly deep. The pulse is of good volume, well sustained, and probably not over a hundred a minute in rate.

(*b*) *The Gray Case.*—If oxygen deficiency is sufficiently great, and in addition the right heart has begun to fail, there may be seen a patient,

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pale, pudgy, gray, with leaden-colored mucosae. The breathing is rapid and shallow, the pulse of poor volume, not well sustained, and the rate high, even to 140 or more. The gray stage may supervene on the initial shock, or follow, more gradually, the blue stage.

Lesions of the nervous system were mentioned. Some cases show mild symptoms and signs referable to the central nervous and the autonomic systems. There may be disorientation; Kernig's sign, muscular weakness, nystagmus, Moebius' sign or unequal pupils, scattered sensory changes, absent abdominal reflexes or retention of urine. Whether or no some of these phenomena may not be independent of the gassing is not clear; they were more common after chloropicrin than phosgene. A case of chlorine poisoning from the gas house at Camp Fremont showed, for a period of an hour, increased knee and ankle jerks and clonus in both these regions and the Babinski and Oppenheim signs bilaterally; other nerve findings were normal. The organs of taste and smell are commonly disturbed.

There may be seen signs of thrombosis in the vessels of the extremities, even including gangrene.

Death may come in the initial stages from the flooding of the lung with edema and other changes described. Death is not common after the first few days. Some cases show a mild delirium or unconsciousness before death.

Some cases have shown a slowed pulse after gassing. The same sign has been found, at times, experimentally; it is not, however, the rule. At any stage of the poisoning the slightest exertion may develop symptoms of great severity in a patient supposedly only slightly gassed or may light up symptoms in a case well on the way to recovery.

The question naturally presents itself as to whether or no there is a similarity between the picture of lung edema in gas cases and that seen at times in nephritis, cardiac decompensation and other conditions. The edema of gas cases is much more severe, and it is accompanied by an acute inflammation, the result of the action of a lung irritant. However, the picture of hyperacute lung edema of nephritis and gas edema may be very similar. Dieulafoy's description of the nephritic variety might well be substituted for that given above of the early stages of phosgene poisoning. The sudden edema, pallor, cyanosis, dyspnea and pulse changes are identical; the lung signs are very similar; bleeding or oxygen relieve equally well the cyanotic cases of either. While, however, morphine and atropin may have found a place with some men in the treatment of the lung edema of nephritis, neither drug is indicated, and either may be harmful in gas cases.

Mustard.—The pathology of mustard gas was shown to develop even more slowly than that of phosgene, and so for a considerable period a soldier may be unaware that he has been gassed. Three to twenty-four hours elapse before symptoms appear.

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The inflammatory reaction in the conjunctivae may cause smarting lacrymation and photophobia, and headaches, either over the eyes or more generalized. In severe cases the eyes may be closed for one to three days.

The pharyngeal lesions lead to distress in swallowing. There may appear early vomiting and severe epigastric pain, both of which tend to persist. Diarrhea may be a feature. The central, peripheral or reflex nature of these symptoms is not determined,

After about twelve hours the affected areas of skin show the erythema and then run the course outlined under pathology. Even after weeks, old, burned areas may show irritation and erythema after bathing in hot water. Blisters have developed some time after admittance to the base hospital.

The pathology in the upper respiratory tract leads early to hoarseness, harsh cough and retrosternal pain. In between twenty-four and forty-eight hours come the respiratory symptoms due to the secondary infection. The latter condition should be contrasted with the early appearance of distressing symptoms in phosgene cases due to edema. Any or all of the symptoms of mustard gas poisoning may grow quite severe, but the pathology that may eventuate in fatality is not usually that due to the direct effects of the gas, but to the secondary infection which has led to purulent and severe bronchitis or to pneumonia;[1] and death if it occurs in this type of case is usually an event of the first or second week.

LATER SYMPTOMS

In the non-fatal cases, in the days and weeks that follow, the symptomotology is most varied.

Phosgene.—These cases show symptoms traceable to bronchitis, or to persisting disturbance in the reflexes controlling respiration and heart and vasomotors. Dyspnea, chest pains usually precordial, cough, dizziness, tachycardia and vomiting are the main complaints. Fatigue is a marked symptom in about a third of the cases. In spite of the persistance of cough and chest symptoms, expectoration, later than the first few days, is not usual. Small râles may be heard in about one third of the cases.

Mustard.—These casualties may show a continuation of the conjunctivitis with photophobia, injection and discharge, and edema of the eyelids, and some of the later effects of the skin burns such as pigmentation, desquamation and rarely cicatrices. As in the case of phosgene, respiratory symptoms may continue. Although mustard gas has

[1] In the Base Hospital 64 series, about 2 per cent of the cases (the cases were received 12 to 72 hours after gassing) developed lobar or broncho-pneumonia. Data are not available as to the percentage in phosgene and mustard cases respectively. Influenza at the same hospital was twice as frequent in gassed as in non-gassed cases.

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not affected the lungs so uniformly and generally, the lesions present have been destructive and the seat of secondary infection, so the cough is about twice as frequent as in phosgene. The pathology being in the larger tubes, there may be found a persisting laryngitis, aphonia functional or organic; and, on auscultation, large râles in contrast to the small ones of phosgene. The abdominal pain and vomiting and sometimes diarrhea may persist. Painful and frequent urination may be present, possibly the result of the occasional high urinary acidity and concentration. Fatigue is one of the less frequent symptoms.

RESIDUAL SYMPTOMS

When seen several weeks or months after gassing, the patients may still present symptom complexes referable to the initial pathology.

Mustard.—These cases, excepting in rare instances, show no symptoms referable to an early oxygen want and coincident damage to bulbar nervous structures. There may be a chronic bronchitis. Vomiting is at times persistent. Functional aphonia is not uncommon. Blepharospasm and photophobia may be features for some time.

Phosgene.—These cases are the more intractable. In gassed cases who have died from other causes sometime later, there have been found no evidences of persistent thickening of the alveolar walls or other persisting pulmonary lesions as has been suggested by certain observers. A subacute or chronic bronchitis may be a feature for many weeks. The question as to liability to pulmonary tuberculosis needs investigation. Persistent vomiting is very infrequently a symptom.

The most bothersome complaints and those that seem still to persist in patients seen at long periods after gassing are the following: dyspnea and tachycardia at rest and increased on the slightest exertion, precordial pains, excessive sweating, slight pallor or cyanosis of the extremities, dizziness, fatigue, unpleasant dreams and unrefreshing sleep. On examination there may be found evidences of vasomotor upset, certain of the eye signs found in hyperthyroidism, at times an enlarged thyroid, perhaps a slightly enlarged heart, a rapid pulse, or increased knee jerks. The patient may not be able to limit the number of respirations per minute to less than ten. The heart rate may not return to normal within two minutes after the increase incident to hopping 100 times on the left foot or similar exercise test; neither may the blood pressure return to normal after the same tests. These findings will be recognized as those that have been grouped together and variously termed Irritable Heart of Soldiers, Distorted Heart Action, Neurocirculatory Asthenia, and Effort Syndrome. And with this group of symptoms civilian physicians will have to deal for some time in gas cases.

Some cases show exaggeration of one or more symptoms of the group; for example, the findings may tend to fit a hyperthyroid picture; others

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show the symptoms mentioned plus those of psychasthenia or neurasthenia.

To treat any of these complexes intelligently, one must know something of the pathology, etiological at the time. There is no evidence of true cardiac pathology excepting as a complication. Acute infections—for example, influenza—may have been a factor at first, but they have long since been removed, and one must look for the pathology present when the patient presents himself. On account of the tremor, nervousness, sweating, tachycardia and other symptoms and signs of thyroid hypersecretion, the latter condition has been thought by some to be the basis of the trouble; thyroid enlargement and exophthalmus have occurred, but they are not common. Some have blamed an irritable sympathetic for the whole picture; it should be noted, however, that there may be signs of voluntary nerve irritability as well. The so-called effort-syndrome cases resulting from gas are very similar to those seen in the United States and elsewhere and due to various causes.

What, then, is the pathological basis of these symptoms? The lesions that might remain in the lungs are not sufficient. Hemorrhages and thrombi found in the brain were certainly the basis of functional change and may possibly have caused organic change in nervous structures. There is experimental evidence of an initial depression of the bulbar autonomic centers of cardiac, respiratory and vasomotor control, and much clinical evidence that disturbance in these centers is lasting.

The symptoms in post-gassed cases and those seen in persons suffering from high altitudes (in balloons, airships or mountains) are similar. The disturbances in high altitudes are due to oxygen hunger. There is disturbance in oxidation in the early stages of gas poisoning, and the lesions of the centers controlling heart, lungs and vaso-motors may be expressed—especially when there is a demand for increase in oxidation—in an inability to absorb and distribute oxygen efficiently. The status resulting from flying or residence in high altitudes and the post-gas status have, in common: polycythemia, relative lymphocytosis, relative polynuclear leukopenia, increase in hemaglobin percentage; and increased respiratory and cardiac rates. Flying and gassing each may cause increase in blood concentration and sleepiness. Mountain sickness, in addition to a like list of phenomena, shares with the gas-status, fatigue, anorexia and nausea, palpitation and dyspnea, increased especially on exertion, disturbed sleep, and slight cyanosis of the extremities. Each condition interferes with holding the breath for as long a period as in the normal. Both are relieved by oxygen or rest. Aviators who have not compensated for the lack of oxygen, and the gassed, show similar disturbances in the cardio-respiratory reflexes.

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When one considers the definite things—namely: (*a*) Initial oxygen want, and (*b*) continued disturbance in the cardiac, respiratory and vasomotor reflexes, which are essential to the proper functioning of the oxidative machine—it is not surprising to find the symptom pictures discussed, nor to find that certain compensatory reactions have been initiated in all the body systems. The most apparent are those already mentioned in the blood and in the nervous, circulatory and respiratory system. Now one and now another of these systems shows signs of excessive "whipping up," or, under too great or prolonged a strain, of breaking down, and so there is presented this or that group of symptoms. Congenital or acquired inferiority in a given organ or system may determine the picture presented; for example, some show the thyroid reaction, or the gassed soldier who is of the proper soil and who has been subjected to prolonged emotional stress may show psychoneurotic symptoms as well.

The aftermath of gas cases is varied. It is the expression of pathological physiology which may be more marked in one or another organ or system. It seems to be dependent, primarily, on interference with the proper functioning of certain reflexes concerned in efficient oxidation in the body. Treatment must aim to remove all etiology tending to interfere with oxidative processes (this includes correction through exercises, to an extent, of the disturbed cardiac and respiratory reflexes) and toward correcting the excess of manifestation through special organs or systems; for example, the thyroid.

SUMMARY

The following conditions may be suggested as the more likely to present themselves in soldiers some time after gassing:[8]

1. The syndrome variously called irritable heart of soldiers, disordered heart action, neuro-circulatory aesthenia or effort syndrome. In gas cases this group of symptoms seems to be due to disturbance in the cardiac, respiratory and vasomotor reflexes which, in addition to their other functions, are essential to oxidative processes. These patients may have more distress in those conditions presenting disturbance in oxidation including, anemias, cardiac and respiratory disease, and carbon monoxide poisoning. Coal tar drugs should be used with greater caution in these patients (P).

2. *Respiratory System:*

(*a*) Larynx; laryngitis; aphonia, functional (M).

(*b*) Bronchi; bronchitis, chronic (M) (P).

(*c*) Alveoli; localized emphysema and (P) disruptive emphysema. (The significance of these lesions is not clear.)

[8](P)—Phosgene. (M)—Mustard.

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3. *Mental and Nervous System:*

(*a*) Psychoneuroses; psychasthenia (P); neurasthenia (P).

(*b*) Functional disturbances: aphonia (M), blephorospasm (M), photophobia (M).

(*c*) Autonomic disturbance especially of cardiac, respiratory and vaso-motor reflexes (P).

4. Pigmentation from burns (M). Cicatrices if burns have been deep (M).

The relation of gassing to pulmonary tuberculosis requires investigation. Gastrointestinal complaints have been intractable in some cases. The gastric lesions in phosgene cases have been described. There is much evidence as to the possibility of swallowing mustard gas, but the lesions are not as yet well known. The possibility of lesions in various viscera, as a result of extensive mustard burns, should be studied when one considers that nephritis, duodenal ulcer and hemaglobinurea have been considered to have resulted from burns due to other causes.

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BLOOD TRANSFUSION AS A THERAPEUTIC AID IN SUBACUTE SEPSIS ASSOCIATED WITH WAR INJURIES

By Captain ABRAHAM ZINGHER

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Introduction.—This communication is intended to draw attention to the necessity for the more frequent and extensive use of small and repeated blood transfusions in our military base hospitals. It is only necessary to go through a series of wards containing surgical cases to realize how beneficial such transfusions would be for these pale, septic-looking and emaciated patients, who are making a difficult uphill struggle to save their limbs or even their lives. The great aid which is so badly needed in the form of a rich supply of red blood cells and blood protein is frequently withheld from these patients, partly by a lack of appreciation of the value of blood transfusion in such cases and partly by an absence of centralized special responsibility for carrying out these transfusions. During the rush period of actual war activities, also, an excessive amount of work for the individual officer and the insufficient surgical help, which existed at times, prevented the systematic and repeated transfusions of blood that were often indicated in suitable cases.

The officers performing blood transfusions also varied in the different base hospitals. Sometimes laboratory officers were called upon to do them, at other times a junior ward surgeon with little or no experience in such work, and, again, the Chief of the Surgical Service, would undertake to do the transfusion himself. The results of such various efforts and the absence of centralized interest in this particular phase of surgery can be seen in the relatively few transfusions that were and are being carried out. As these cases often requiring repeated blood transfusions are present now in most of the base hospitals and will continue to be present for some time, it is none too late to again call attention to the indications which are very definite in many of the cases. These indications can be summarized as follows:

Indications for Blood Transfusion:

1. Extensive suppurating wounds associated with a subacute form of sepsis.
2. Compound infected fractures associated with a subacute form of sepsis.
3. Various grades of anemia associated with a subacute form of sepsis.
4. Various grades of emaciation and partial marasmus.
5. Before and after severe operations as an emergency measure.

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While in the forms of acute infections associated with a septicemia, blood transfusion has not shown any extraordinary results, in these more subacute forms with a prolonged and extensive suppuration the effects would be excellent. The freshly injected blood, introduced from time to time, acts in a most beneficial manner in increasing the resisting power, physical, chemical and immunological, of the patients. Every physician is acquainted with just such cases, in which transfusion of blood has saved lives. But in the saving of limbs, also, a fresh supply of nutritious blood is bound to become an important factor. In these cases the injected blood serves not only to replace the diminished number of red blood cells and the low hemoglobin content, but, as is well known, the injected plasma brings with it an abundance of nutritive and bactericidal properties.

For the anemias the transfusion of blood is certainly indicated. It supplies a fresh amount of blood and also stimulates the patient's blood-forming organs to continue producing an increased number of red blood cells. Yet we see many a patient in our base hospitals being allowed to carry on his struggle for recovery without the aid of blood transfusion.

Again, for the cases showing extensive grades of emaciation from various causes such transfusions are definitely indicated. These patients are not only emaciated, but their tissues are more or less devitalized. Such conditions are, of course, generally associated with prolonged sepsis, an inability of the body to properly utilize the ingested nourishment, and with various grades of anemia. They often develop bed sores from pressure upon their bony prominences. These patients have been, as a rule, lying around in the wards for some time, have gone through many a hard siege with their wounds, and do not seem to have sufficient recuperative power to enable them to convalesce properly. Repeated small blood transfusions, by acting as a new stimulant and an important nutritive element, will be certainly beneficial to their undernourished and devitalized tissues.

The cases requiring blood transfusion as an emergency surgical measure are self-evident. Yet lives are sacrificed by a failure to transfuse patients either before or, more often, after an extensive shock producing operation. In such cases the injection of blood is a pure life saving procedure and preparation for it by previouly knowing the blood group of the patient and having on hand a suitable donor, will often mean the difference between saving and losing the patient.

Donors of Blood.—Objections have sometimes been raised that donors are not easily obtainable. Anyone who has had experience with blood transfusions knows that donors can be secured if any consistent effort is made to get them. With the great desire on the part of many civilians to show their patriotic feelings in some direct way that would be

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beneficial to the soldiers and with the generous spirit of our healthy soldiers, there should be no difficulty in having a classified list of tested donors who could be reached whenever needed. It is necessary, however, that each donor should be, if he so desires, properly remunerated for the blood which he gives. Relatives, also, of the wounded soldiers are in the States almost constantly available. It is not, therefore, a question of a lack of donors, but simply that of a little foresight and exertion on the part of those responsible for the blood transfusions.

The testing of donors and patients for blood grouping can be readily and conveniently accomplished by the method of Moss, using for the test a serum of Group II and one of Group III. These test-sera are kept in sealed glass capillaries, so as to have them in convenient form for immediate use. A drop of each of the two sera is placed on a clean glass slide and a drop of blood from the finger of donor or patient is added to each drop of serum. When no agglutination of the red blood cells takes place the individual belongs to Group I. When agglutination with serum of Group III occurs, and none with serum of Group II, he belongs to Group II; agglutination with serum of Group II, and none with serum of Group III, indicates that he belongs to Group III; when agglutination occurs with both sera it indicates that the individual being tested belongs to Group IV.

Special Operators in Charge of Blood Transfusions.—The great importance of the subject calls for the assignment of the work connected with blood transfusions to specially qualified officers. It would be very desirable that such an officer, fully conversant with the technical details and indications for transfusion, should be available in every base hospital and base hospital center. He could be called into consultation on suitable medical and surgical cases, in whom a transfusion is indicated. He even could in a general way know most of the very ill cases throughout the wards and help the surgeons in the selection of those suitable for transfusion.

This officer would also look to the constant availability of donors, and he himself or an assistant test the donors and patients for blood grouping. These tests should also be extended to the personnel of the hospital, who might at any time become available as donors. Wassermann tests should, of course, also be made and recorded for each donor.

Method and Technique of Blood Transfusion.—It is generally agreed that for nearly all purposes the citrate transfusion is the simplest and best. Some question has been raised whether the injected red blood cells in citrate transfusions continue to live and functionate in the new host or whether they soon disintegrate. If the blood is immediately injected after it is withdrawn from the donor and citrated, the red blood cells continue, no doubt, to functionate as a part of the circulating blood of the new host. The same holds true for the blood plasma. It is only

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if the blood is kept as an available supply in the ice-box for days, as is occasionally recommended for emergency purposes, that the red blood cells and the blood plasma are changed and lose most of their value as homologous living tissue. The blood will then not serve the purpose for which it was intended.

The amount of sodium citrate to be used seems to vary with different operators. In the strength of 0.2 per cent of sodium citrate in the final mixture (1 part 2 per cent solution of sodium citrate and 9 parts of blood) the blood will frequently clot at the time of withdrawal and give considerable difficulty at the time of injection. This was the strength originally recommended by Lewisohn. The circular from the Surgeon General's Office recommends 0.7 per cent sodium citrate. Since an excess of the citrate has been claimed to be toxic, it will be found advisable to use an amount slightly above the one necessary to prevent coagulation and thus obtain a sufficient margin of safety. The writer recommended more than four years ago the use of a 0.33 per cent citrate strength. He adds to each cubic centimeter of a 10 per cent solution of sodium citrate 30 c.c. of blood. The greater concentration of the original citrate solution also avoids an unnecessary dilution of the blood to be injected.

The technique of the citrate transfusion has been thoroughly standardized in the Army, and it will give, as a rule, quite satisfactory results. The apparatus which has been devised and is available for use in the base hospitals seems to be very good and fulfils all the requirements for convenience and accuracy.

Amount of Blood To Be Transfused.—The amount of blood should not be large in the cases considered here, unless we are dealing with a secondary hemorrhage or an intense degree of anemia. Generally, from 250 to 300 c.c. of blood will be found sufficient. Such transfusions avoid the danger of suddenly throwing upon the circulation an excessive burden, to which the frequently degenerated heart muscle may not readily adjust itself. The transfusion may have to be repeated several times. It becomes necessary, therefore, to avoid cutting down upon the veins when doing a transfusion. There is in fact very seldom any reason for the operator to cut down upon the vein of an adult, except under very unusual circumstances. Indeed very few adults will be found whose veins cannot be made sufficiently prominent by a properly applied tourniquet. One sees from time to time patients coming to base hospitals who show ugly scars at the bend of the elbow, following exposure of the vein for purposes of blood transfusion. Unless these operations were carried out as an extreme emergency, they seem to be rather unjustifiable.

Repetition of Blood Transfusion.—This would depend to a large extent upon the special indications in each case. The progress of the

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wound, the hemoglobin content, and especially the general condition of the patient are good criteria to go by. The intervals between the transfusions would ordinarily be from 7 to 14 days. One important factor, which is not always considered, should be borne in mind. The blood of one donor may be much more suitable for a patient than that of another one. For that reason, also, the transfusion should be repeated, if the progress of the patient is not as satisfactory as could be desired after one transfusion, with the blood from another donor.

Studies of the Effects of the Blood Transfusions.—Special studies should be made and careful records kept of the effects of single and repeated blood transfusions in these cases of subacute sepsis associated with war wounds and infected compound fractures of the limbs. The tabulated reports from the different base hospitals in these groups of cases would soon offer valuable data by which to gauge the exact value of the limb and life-saving effects of such transfusions.

Summary and Conclusions.—1. Blood transfusions should be used more extensively on the wounded soldiers in the base hospitals.

2. Officers should be especially assigned to this work in the different base hospitals and base hospital centers, whose sole duties would be in connection with the performing of transfusions, consultations on surgical and medical cases and the keeping track of suitable donors.

3. The special indications considered here are subacute sepsis, associated with extensive suppuration or with infected compound fractures, with anemia and emaciation of varying grades; also as a prophylactic measure in enfeebled individuals before severe operations and in cases of postoperative surgical shock resulting from extensive loss of blood during an operation.

4. Large pockets of pus, suppurating joints or extensive empyemas must, of course, be freely incised and drained. No blood transfusion will help in the elimination of these sources of continuous reinfection, unless they are carefully watched for and taken care of as they arise. Autopsies often bring to light such complications, which should have been taken care of while the individual was still alive.

5. The transfusions should be of moderate amounts of blood, from 250 to 300 c.c., and repeated, if necessary, every 7 to 14 days.

6. Systematic efforts should be made to find these patients in the base hospitals. Special studies should be made and careful records kept after the transfusions, so as to obtain as soon as possible tabulated data that will help in more definitely indicating the value of blood transfusion in cases of subacute sepsis associated with extensive wounds and fractures.

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TRENCH NEPHRITIS AT A BRITISH GENERAL HOSPITAL IN FRANCE*

By Captain REGINALD FITZ
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(With four illustrations)

INTRODUCTION

DURING the war an abundant literature upon so-called "trench nephritis" has accumulated in English, French, and German periodicals. Beyond the facts that the disease was relatively common amongs the various troops, that it is of uncertain origin and that it has a typical clinical picture, little is known about the condition. Trench nephritis is best defined in the words of Maj. Gen. Sir John Rose Bradford,[1] as a type of nephritis occurring among soldiers and characterized by the frequent presence of bronchitis and dyspnea, the suddenness of onset of uremic manifestations, the rapid subsidence of well-marked renal dropsy, the rarity of occurrence of inflammatory complications, and an extraordinarily low mortality.

It has been the writer's privilege to act as a medical officer at British general hospitals in France since June, 1917. The following observations on trench nephritis are reported, in order to present further evidence illustrating the peculiarities of this disease as seen in British general military hospitals during this time.

STATISTICAL STUDY

At the outset a statistical study of the cases admitted to one hospital during the summer of 1917 was undertaken in order to determine: (1) The relative frequency of this type of nephritis among the medical casualties, (2) the age of nephritic patients as compared with patients with other medical casualties, (3) whether relatively new and untrained troops were more susceptible to nephritis than older and more seasoned soldiers, and (4) whether evidences of an epidemic form of the disease could be discovered.

To determine these points the hospital admissions were divided into medical and surgical cases. The medical cases included all such as are ordinarily received in the medical wards of a civilian general hospital. The diagnosis of trench nephritis was made in cases with a history or physical findings of sudden dyspnea and edema, confirmed by finding of albumin and casts in the urine.

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* From the Medical Division, U. S. Army Base Hospital No. 5.

[1] Maj. Gen. Sir John Rose Bradford. Quart. J. Med., 1915, ix, 125.

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Cases diagnosed hematuria or albuminuria without the association of other nephritic symptoms were omitted. The surgical cases included wounds, gas poisoning cases, and such surgical conditions as sepsis, hernia, and genito-urinary diseases. Borderline cases were arbitrarily classified. Otitis media was considered a medical casualty, as was unoperated appendicitis. It seemed best to include the latter disease in the medical category since many patients were admitted with the history and clinical manifestations of mild appendicitis, which cleared up promptly after a few days' rest. Cases of hemorrhoids, on the other hand, were grouped among surgical diseases, although many were not severe enough to indicate operative treatment. The medical cases were tabulated, and the age and length of time spent in France were recorded. To discover possible epidemic foci of nephritis, it was attempted to trace all the medical cases, as nearly as possible, to their original positions in the line. It was impossible to obtain accurate information in this respect. However, the usual itinerary of a sick patient from the front to the base was through a field ambulance, whence in turn he was directed through a casualty clearing station. So far as possible a record was kept of the different field ambulances through which the patients passed.

FREQUENCY OF TRENCH NEPHRITIS

The frequency of trench nephritis as a medical casualty is shown in Table I.

TABLE I

	Medical cases	Trench nephritis	
		Cases	Per cent
June, 1917	589	24	4.1
July, 1917	414	21	5.1
August, 1917	530	28	5.3
September, 1917	727	35	4.8
Total	2,260	108	Av. 4.8

It is apparent from this table that between 4 and 5 per cent of all medical casualties were due to trench nephritis, as determined from the histories and from routine physical examination. No obvious case of chronic nephritis with persistent hypertension and cardiovascular changes was encountered. Unfortunately, comparable statistics from other hospitals were not available; however,

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Hurst[2] states that an average of 13 male cases of acute nephritis are encountered each year at St. Bartholomew's Hospital in a total of 7,000 patients. If these figures are taken as typical in a general civilian hospital, and the figures from Table I are considered representative of acute nephritis in a general war hospital during the summer months, the striking frequency of the disease among troops is well illustrated.

AGE INCIDENCE

The ages of 2,254 patients were tabulated in five-year periods, except that a single group was made for patients less than twenty years old and another group for patients over forty. In order to compare most readily the nephritis cases with all others the figures were reduced to ratio per 1,000. The findings are shown in Table II.

TABLE II

Age	General medical cases		Cases of nephritis	
	Actual number	Per 1,000	Actual number	Per 1,000
Under 20.....	170	75	5	46
20–25.....	665	295	18	167
25–30.....	521	231	25	231
30–35.....	369	164	24	227
35–40.....	268	119	18	167
Over 40.....	261	116	18	148

As might be expected, there were relatively few medical cases among men less than twenty years old. The greatest number occurred between the ages of twenty and twenty-five, and the incidence fell as the ages grew greater. The most obvious explanation for this is that the greatest amount of illness fell among the greatest number of possibilities. Young soldiers were more numerous than old soldiers, and they therefore predominated among hospital patients.

The ages of the nephritic patients did not follow this curve however. As pointed out by Bradford, a certain number were young men, though the majority are in the older groups. Although, on account of the small material, the evidence is by no means convincing, it confirms the work of other writers, notably Starck[3] and Hirschstein,[4] who found the greatest number of cases in men between thirty and forty.

[2] Hurst. Medical Diseases of the War, 1917, Edward Arnold, London, p. 185.
[3] Starck. München med. Wchnschr., 1917, lxiv, 193.
[4] Hirschstein. Berl. klin. Wchnschr., 1916, liii, 1045.

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RELATION TO LENGTH OF SERVICE

It was possible to discover the length of service in France in the case of all the nephritis patients and in 2,230 of the general medical patients. For convenience the figures are recorded in six-month periods, and to make results comparable they are stated in actual numbers and in ratio per 1,000.

TABLE III

Length of service in France, months	General medical cases		Nephritis cases	
	Actual	Per 1,000	Actual	Per 1,000
6 or less	918	412	59	546
6–12	567	254	22	204
12–18	338	152	9	83
18–24	237	106	9	83
24–30	103	46	6	55
30–36	66	30	3	28
Over 36	1	0.4	0	0

The general cases were most common among the newly arrived troops and diminished in almost direct proportion to the length of time spent in the field. Two factors probably are accountable: (1) the preponderance of new troops over old; (2) young troops inexperienced in field work are notoriously sensitive to disease of all kinds. The nephritic cases reacted in essentially the same way. There seemed relatively more cases among soldiers who had been in France less than six months and relatively fewer cases among the more seasoned troops than in the general clinic, although the figures are too small for conclusive evidence. Such as it is, it confirms Bradford, who found that many of his cases occurred in men who had been serving from two to five months in France, and disagrees with Hogarth,[5] who found nephritis commoner in those who had been six months or more at the front.

EPIDEMIOLOGY

Since each large group of troops was treated at its own field ambulance continuously, it seemed reasonable to believe that, if nephritis was pandemic, those field ambulances which sent back the greatest number of medical casualties would also send the greatest number of nephritics. If, on the other hand, nephritis occurred in epidemic foci, a few field ambulances might be expected to receive large numbers of cases, and there would be relatively little

[5] Hogarth. Journ. R.A.M.C., 1916, xxi, 379.

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diffusion. Of the medical cases, 1,947 were traced to their original field ambulances; 191 ambulances sent cases, one sending 85, and 45 only one case each, the rest sending intermediate numbers. Of the nephritic cases, 77 were traced to their original ambulances; 51 ambulances sent cases, the largest number from any one ambulance being 4. Generally the ambulances sending the greatest number of medical cases also sent the greatest number of nephritics, although the figures were not absolutely parallel. There was no evidence of any epidemic focus of nephritis; the disease appeared in a great number of men scattered over a wide area.

SUMMARY

Taking the statistical study as a whole, certain conclusions are justifiable from the facts observed. Trench nephritis occurred in about 5 per cent of all medical cases in a typical war hospital during the four summer months of 1917, when disease was probably at a low point. An acute type of nephritis was thus strikingly more common than in a civilian general hospital. It did not occur in epidemic foci, but was scattered over a wide area, suggesting that the cause of the disease was common to all troops in the field irrespective of local conditions. The most susceptible troops were the relatively old men who had been in France less than six months. It occurred to a certain extent among the youngest men as well as among those who had been in France from the beginning of the war.

CLINICAL OBSERVATIONS

As it was desirable to make a careful clinical study of trench nephritis, it seemed preferable to follow thoroughly a few cases for a reasonable length of time, rather than to obtain single facts from a large group. Accordingly twenty-two typical cases were selected from the patients admitted to the hospital. They were studied in the following way: At entry a careful history was obtained, and a routine physical examination was made. A form of treatment which could be used constantly in order to make observations on different cases comparable, and at the same time in keeping with current views as to proper therapy of the disease, was employed. A rudimentary diet kitchen was established, making it possible to measure and weigh the daily amount of fluid and solid food. No attempt was made to record the calorific value of the food, but precautions were taken to make sure that the fluid intake was constant and that the diet was low in protein and chlorides. The diet consisted of milk, tea, bread, jam, rice, eggs, and chicken; with added potato, onion and fruit in some cases. Little butter was used

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because of its variable salt content; the other foods were cooked without addition of salt.

As a routine, the fluid intake was fixed at 1,500 c.c. per 24 hours. At entry in the most serious cases nothing but water was given for three or four days until the acute and critical stage was passed. In less severe cases 600 c.c. of milk and 900 c.c. of tea or water were given at the outset. From this basis the diet was modified from time to time according to the individual patient's reaction. It seemed best to bleed three patients who had convulsions and to give small doses of caffein to a few others in the hope of establishing diuresis. Otherwise the patients were kept warm and were left alone.

The twenty-four-hour urine was collected in glass bottles, preserved with chloroform, and kept at the bedside. It was measured every day, the gross appearance and specific gravity were noted. The albumin content was estimated by Esbach's method and the sodium chloride content by a modified Volhard titration. The urine was sedimented every other day and examined microscopically. The appearance or disappearance of edema was noted by physical examination and was more accurately followed by the water balance and periodic weighing of the patients. Systolic and diastolic blood pressure readings were made every day or two by the auscultatory method with a Tycos apparatus. Blood sugar estimations were made in four cases by the method of Meyers and Baily,[6] to ascertain if it were increased as has been described in certain cases of chronic Bright's disease. (Since the results were universally and repeatedly negative this analysis was not continued.) Dyspnea has been emphasized as a striking part of the clinical picture and has been associated in certain cases, according to Brown,[7] with a lowering of the alveolar CO_2 tension. It was therefore important to determine whether acidosis was a constant feature in the disease and accountable for this symptom. Van Slyke's[8] method was employed in twelve cases for estimating the alkaline reserve of the blood plasma; McLean's[9] adaptation of Ambard's constant was used as a test for renal function in twenty cases. The latter test gives substantially the same information as the phthalein test of Rowntree and Geraghty[10] and has the advantage of requiring blood urea analysis. The urea in both blood and urine was estimated

[6] Meyers and Baily. Jour. Biol. Chem., 1916, xxiv, 149.
[7] Brown. Brit. M. J., 1916, i, 397.
[8] Van Slyke. Jour. Biol. Chem., 1917, xxx, 347.
[9] McLean. Jour. Exper. Med., 1915, xxii, 212, 366.
[10] Rowntree and Geraghty. Arch. Int. Med., 1912, 294.

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by Van Slyke's[11] urease method, aspirating the ammonia into appropriately normal acid with a chest aspirating pump or by water pressure.

Though the cases studied by these methods were few in number, they seemed typical of the disease as heretofore described. Nineteen cases at entry presented a history of less than two weeks' duration; of these patients one had been ill only one day. Three patients were unable to give the date of onset, but did not show signs of having pre-existent chronic nephritis; these probably belong to the acute group. In nineteen cases there was marked dyspnea or orthopnea when they first came under observation. Four cases had a history of sudden or repeated attacks of epileptiform convulsions simulating uremia. Twenty-one patients entered with definite edema. In none of the cases were there inflammatory complications, and none died of nephritis. Thus, taking the group as a whole, the cases belong in Bradford's classification of trench nephritis.

DYSPNEA AND ACIDOSIS

The important features of acidosis in relation to dyspnea, as observed in this series, have been grouped together.

Private W. S. A. entered the hospital on June 20, 1917. One week previously he had suddenly become edematous. At entry he was comfortable, breathing easily , and had no demonstrable edema. Systolic blood pressure was 150, diastolic 75; urine had only a trace of albumin, with a few leucocytes and red blood cells in the sediment. The combining power of plasma for CO_2 was 50 volumes per cent, a reading slightly lower than normal.

Private T. J. entered the hospital on June 15, 1917. A week before entry he woke with swollen face and feet and noticed that his "wind was not so grand" on exertion. At entry he was dyspneic; there was slight edema of the extremities, around the eyes and over the sacrum. Systolic blood pressure was 178, diastolic 110; the urine contained much blood, a little epithelium, and 0.3 per cent albumin. The combining power of plasma for CO_2 was 42 volumes per cent. The last test was repeated four days later when the blood pressure had fallen to 150 systolic and 100 diastolic, dyspnea had ceased and the edema had disappeared, although the urine still contained albumin and blood; the reading was again 42 volumes per cent.

Private E. C. O. entered on June 18, 1917, with a history of edema and dyspnea, which had developed suddenly four days previously. At entry he was short of breath but not orthopneic. There were slight edema of the face and over the sacrum, but not of the legs, a suggestion of ascites, and a few moist râles at the base of each lung. Blood pressure at entry was 152 systolic and 80 diastolic, the urine contained 0.6 per cent albumin and numerous hyaline and granular casts. The blood withdrawn shortly after arrival had a combining power for CO_2 of 48 volumes per cent, slightly more

[11] Van Slyke. Jour. Biol. Chem., 1914, xix, 211.

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than in the preceding case, although the dyspnea was greater. Four days later (June 22) the blood pressure had fallen to 150 systolic and 85 diastolic, and the dyspnea had improved, though the urine still contained albumin and casts. A second blood test gave a reading of 55 volumes per cent, well within normal limits.

It might be judged by this case alone that the improvement in acidosis was coincident with disappearance of edema and dyspnea, falling blood pressure and general improvement. These factors were not necessarily related, as is shown by the two following protocols.

Private T. G. entered the hospital on June 23, 1917, with dyspnea of a week's duration. The urine had been examined at the casuality clearing station on June 17 and found negative for albumin. On admission there were slight edema of the face and eyes and no marked dyspnea. The latter developed rapidly, so that three days later he was orthopneic and had ascites, general anasarca and brawny edema of arms, legs, abdominal wall and over sacrum. Inasmuch as the heart was of normal size, of regular rhythm and slow rate, it seemed probable that the dyspnea was not of cardiac origin. The urine had 0.5 per cent albumin and contained many hyaline and granular casts. The blood pressure was 150 systolic and 90 diastolic.

The essential features of the case are grouped together in Table IV.

TABLE IV

Date	Weight, kilos	Dyspnea	Combining power for CO_2, plasma Volumes, per cent	Blood pressure		Blood urea, gms. per liter	Urea index	Albumin, gms. per 24 hrs.
				Syst.	Diast.			
June 23...	76.0	Marked	47.0	150	90	.....	.....	12.8
July 5....	69.3	None	52.0	120	60	0.332	39	5.5
July 11....	63.0	None	61.0	100	54	0.292	33	3.0
July 25....	63.2	None	48.0	104	52	0.352	53	4.0

As in the preceding case, there was slight acidosis at entry which did not seem accountable for the dyspnea but which tended to disappear as the blood pressure fell, as the edema disappeared and as the albuminuria diminished. However, on July 25, one month after entry, the degree of acidosis was as great as at first, although the patient was nearly free of edema and had no exacerbation of dyspnea. The urea index had risen from 30 to 50, and the excretion of albumin had dropped from 13 grams in twenty-four hours to 4 grams, showing that the kidney condition was much improved.

Private J. L. L. had an indefinite history of onset of symptoms. It is known that five months previously he was in a military hospital with

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bronchitis, but without any signs of nephritis. At entry to United States Base Hospital No. 5, in July, 1917, he suffered from dyspnea (although with negative cardiac signs), ascites and marked edema of the legs and sacrum with râles at bases of both lungs without hydrothorax. The chief points of interest are tabulated together in Table V.

TABLE V

Date	Weight, kilos	Dyspnea	Combining power for CO_2 plasma. volumes, per cent	Blood pressure		Blood urea, gms. per liter	Urea index	Albumin, gms. per 24 hrs.
				Syst.	Diast.			
July 3....	70.8	Marked	50	180	80	0.694	19	6.8
July 9.....	68.5	None	53	144	80	0.662	9	5.4
July 15....	67.5	None	52	128	65	0.712	14	7.2
July 22....	64.1	None	54	125	60	0.662	23	3.2

Although the course of nephritis was severe as judged by the increase in blood urea and the low urea index, there was almost no acidosis. The acidosis bore no relation to the symptom of dyspnea and was not coincident with either high blood pressure or renal insufficiency.

The other cases reacted in much the same manner. Taking this series together it becomes evident that slight acidosis as measured by Van Slyke's method is not uncommon in this type of nephritis, but is in no way accountable for the dyspnoea. The cases with severest dyspnea did not necessarily develop the greatest acidosis, nor did acidosis cease as the shortness of breath improved. It seems probable that the acidosis was similar to that which has been described as an accompaniment of chronic nephritis and referable to impermeability of the kidney rather than to overproduction of acids within the body.

CONVULSIONS

The cases in which convulsions developed while under observation presented such a striking clinical picture that they are discussed in detail.

Private R. W. L., 19 years old, entered July 6, 1917, 11.30 p. m. When first seen he was in deep coma, breathing stertorously and having frequent convulsions. The physical examination was negative except for slight edema of the face and over the sacrum. The systolic blood pressure was 150; a catheter speciment of urine contained a trace of albumin and a few hyaline and granular casts. He was given morphia immediately without definite effect. Between 2 a. m. and 8.45 a. m. he had fourteen typical epileptiform fits, each lasting from thirty-five seconds to two minutes. Lumbar puncture was performed but seemed to aggravate the condition. Finally 500 cc. of

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blood were withdrawn, after which the fits stopped and the patient made a gradual recovery. It is noteworthy that the patient was never able to give any history. He remembered leaving the trenches and being put on a train, but was unable to tell what happened subsequently or immediately before.

An analysis of blood, on July 7, showed blood urea 0.560 grams per liter, and combining power of plasma for CO_2 as 60 volumes per cent.

On account of the patient's unconsciousness it was impossible to obtain a specimen of urine. The blood findings, however, showed no acidosis and only a slight accumulation of urea, much less than is ordinarily encountered in the uremia of chronic Bright's disease.

On the following day the patient was still comatose, so that no 24-hour specimen of urine could be obtained. A short period test was made according to McLean's method with the following results (Table VI):

TABLE VI

Date, July 8, 1917; time of period, 2½ hours; amount of urine excreted. 190 c.c.; weight, 48.3 kilos; 24-hour rate of excretion, 1,800 c.c.; appearance of urine, high, slightly cloudy; specific gravity, 1,010; sediment, a few hyaline casts. No blood.

	Grams per liter C	*Grams per 24 hours* D
Albumin	2.00	3.6
Urea	20.00	36.00
Sodium chloride	4.0	7.20
Blood urea	0.552	
Urea index	98.00	

It seemed striking that so nearly a normal kidney function should be associated with a condition suggesting very severe uremia. The kidney allowed the free passage of water, was able to concentrate and excrete urea and chloride, there was not a great albuminuria nor very pathological sediment. The blood, on the other hand, was much as at entry. The blood urea was increased a little, although the urea index was within normal limits.

The subsequent course was uneventful. The edema disappeared at once; the blood pressure fell from 150 at entry to less than 130 in two days; there was never any oliguria; the albumin cleared, although a few casts were always found in the sediment. Repeated tests for kidney function by McLean's method showed an urea index variable but always within normal limits, and the blood urea dropped from 0.560 gram per liter at entry to 0.282 gram per liter some three weeks later.

Three features are worthy of comment. At entry the axillary temperature registered 100.6° which rose to 103.4° by mouth on the following morning; this febrile disturbance was over in three days. Blood culture and agglutination tests for the typhoid-paratyphoid group were negative; there was no leucocytosis.

The spinal fluid was under increased pressure and flowed very freely, but was normal histologically and culturally.

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Finally, the cloride excretion in the urine was definitely abnormal. A 24-hour specimen could not be obtained until July 11 (four days after entry); this urine contained little salt. On the following days the chloride excretion increased from 2.00 grams to 11.00 grams per 24 hours a week later, and gradually fell to about 5 grams per day. Although not associated with polyuria or rapid loss in weight, this suggested a "dechlorurination" from preëxistent edema.

Private R. B. L., Canadian, twenty-four years old, entered the hospital on August 10, 1917. He had been taken ill eight days previously, developing swelling of his legs, face and eyes, considerable cough, dyspnea and headache. A specimen of urine analyzed at the casualty clearing station showed large traces of albumin and a few casts.

The physical examination at entry was negative except for dyspnea and edema. The systolic blood pressure was 170. The patient was slightly confused mentally and did not remember events immediately preceding entry. He had three severe epileptiform convulsions in twenty-four hours, relieved by bleeding and morphia.

The blood withdrawn to check the convulsions had a urea concentration of 0.422 gram per liter. A short period test was made seventy-two hours later with the following results (Table VII):

TABLE VII

Date, August 20, 1917; time of period, 72 minutes; amount of urine excreted, 70 c.c.; weight, 69.0 kilos; 24-hour rate of excretion, 1,400 c.c.; appearance of urine, normal, clear; specific gravity, 1,009.

	Grams per liter C	*Grams per 24 hours* D
Urea	13.05	78.25
Sodium Chloride	7.70	10.78
Blood urea	0.322	
Urea index	83.00	

The blood urea was low, the urea index was within normal limits, and the kidneys' concentrative functions for urea and sodium chloride were not markedly diminished as judged in a single specimen of urine.

As in the first case, however, the chloride excretion per 24 hours was definitely abnormal, being very low at first, followed by a large output which in turn returned to a constant. In this case the "dechlorurination" was associated with loss of weight, polyuria and the disappearance of edema.

Sergeant Major H. H. entered the hospital on September 10, 1917. During the previous three weeks he had gradually developed edema, dyspnea and headache. At entry he looked pasty and had slight edema around the eyelids and over the sacrum and ankles. Except for moderate right-sided hydrothorax and slight ascites the physical examination was negative. Blood

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pressure was 196 systolic and 110 diastolic; the urine contained numerous hyaline and granular casts, red corpuscles and 0.16 per cent albumin. Shortly after entry he had a severe epileptiform convulsion. A short period test for kidney function was immediately made.

TABLE VIII

Date, September 10, 1917; time of period, 72 minutes; amount of urine excreted, 90 c.c.; weight, 72.7 kilos; 24-hour rate of excretion, 1,800 c.c.; appearance of urine, normal; specific gravity, 1,009; sediment, hyaline and granular casts; epithelium; blood.

	Grams per liter C	*Grams per 24 hours* D
Albumin	0.90	1.60
Urea	9.52	17.10
Blood urea	0.420	
Urea index	37.00	

As in other cases, there was a slight increase in blood urea, though the urine was of sufficient quantity and concentration to suggest that the kidney was not severely damaged. The urea index was 37, lower than in the other cases. However, as it seemed evident that renal function was not alarmingly abnormal, the patient was given morphia and left alone. Two days later he had a second convulsion, which was treated by morphia. Finally, on the third day he had two more severe convulsions; 50 c.c. of blood were withdrawn. The patient had no more fits and made an uneventful convalescence. The blood urea had fallen to 0.275 gram per liter despite the continuance of symptoms. Two weeks later the blood urea was 0.180 gram per liter and the urea index was 150.

In other respects the patient reacted almost as did R. B. L. Systolic blood pressure remained at about 190 for a week and gradually fell to 155. Little chloride was excreted during the first twenty-four hours, but later rose to 14.00 grams per twenty-four hours and then fell to about 8 grams. The patient was at no time oliguric, as judged by the water balance. During the second week, however, while he was excreting large amounts of chloride, he had pronounced diuresis and lost 7.5 kilos. in weight.

Private H., twenty-seven years old, entered September 16, 1917. Ten days before entry he noticed swelling of the legs, puffiness of eyes and breathlessness. He was kept in a field ambulance until he seemed in condition to be sent to the base.

Physical examination was negative except for marked edema of the face, sacrum and ankles. Shortly after entry he had two severe convulsions relieved by morphia. Subsequently he made an uninterrupted convalescence. As in the other cases, the blood urea taken after his fits was slightly increased (0.380 gram per liter), although the urea index was normal. The blood pressure was 188 systolic, but fell very promptly. Excretion of chloride was low at first, but increased rapidly. The patient was evacuated after two weeks, having lost 15 kilos. in weight. The systolic blood pressure was then 120; the blood urea was lower than at entry; the urea index was normal; the urine still contained albumin, blood and casts, although the patient's general condition had much improved.

Taking the four cases together, there are certain striking features. All of these patients developed convulsions within a day

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following entry to the hospital, after a fatiguing journey of considerable length and exposure. None had had convulsions before entry and there seemed to be no reason for predicting this complication. In three of the cases the systolic blood pressure was at least 170. While other non-convulsive cases were seen with equally high blood pressure, and one convulsive case occurred with a lower pressure, the association between hypertension and convulsions was noteworthy. Other writers have commented on this fact and Bradford and Schütz[12] go so far as to advocate venesection whenever the blood pressure exceeds 160, claiming that the tendency to uremia is thereby diminished. None of the cases showed a significant accumulation of blood urea with alarmingly lower urea index. Had it not been for the symptoms all would have been considered mild cases if the diagnosis were based on functional studies alone. In all of the cases there was impairment in the 24-hour excretion of sodium chloride, followed by an excessive excretion, suggesting that chloride retention was a feature common to all. From these facts it does not seem probable that the convulsions were "uremic" in the ordinary sense; it is possible that some cerebral circulatory disturbance or localized edema was the underlying cause.

IMMEDIATE REACTION OF TRENCH NEPHRITIS TO HOSPITAL CARE

In all cases, whether with or without such complications as convulsions or pronounced dyspnea, reaction was very similar. At the outset it was possible to distinguish two large groups, consisting of cases which improved immediately, and of cases with a tendency to a subacute or chronic course. In each group, however, the kidney acted functionally in the same fashion, much as in chronic Bright's disease or in acute experimental nephritis. At entry, the patients complained of the same train of symptoms; there was almost invariably a history of sudden onset of dyspnea and edema. Physical examination was negative except for edema of the face, legs and body, less commonly of the serous cavities and rarely of the genitals. Blood pressure was almost always elevated, though in certain cases it was normal or subnormal. The urine contained much albumin, blood, leucocytes, epithelium and casts of every sort. Certain cases seemed to have more bleeding from the kidneys than others, though it was impossible to find convincing evidence that there is an essential difference between cases with marked hematuria and those with little renal hemorrhage. The most common abnormality of function was chloride and water retention with associated edema. If the lesion were sufficiently

[12] Schütz. Deutsche med. Wchnschr., 1917, xliii, 180.

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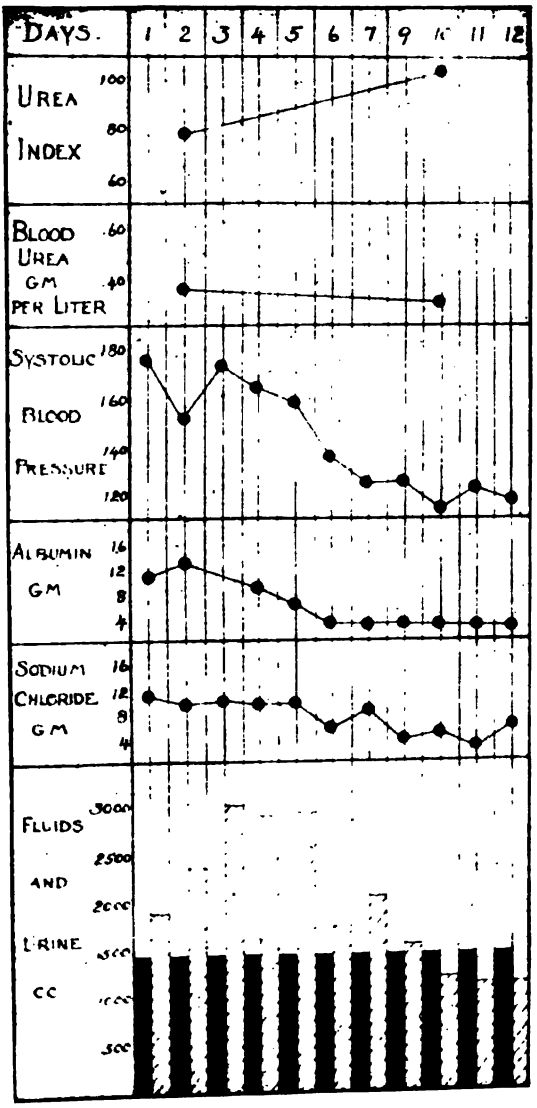

CHART I.

(To face page 93.)

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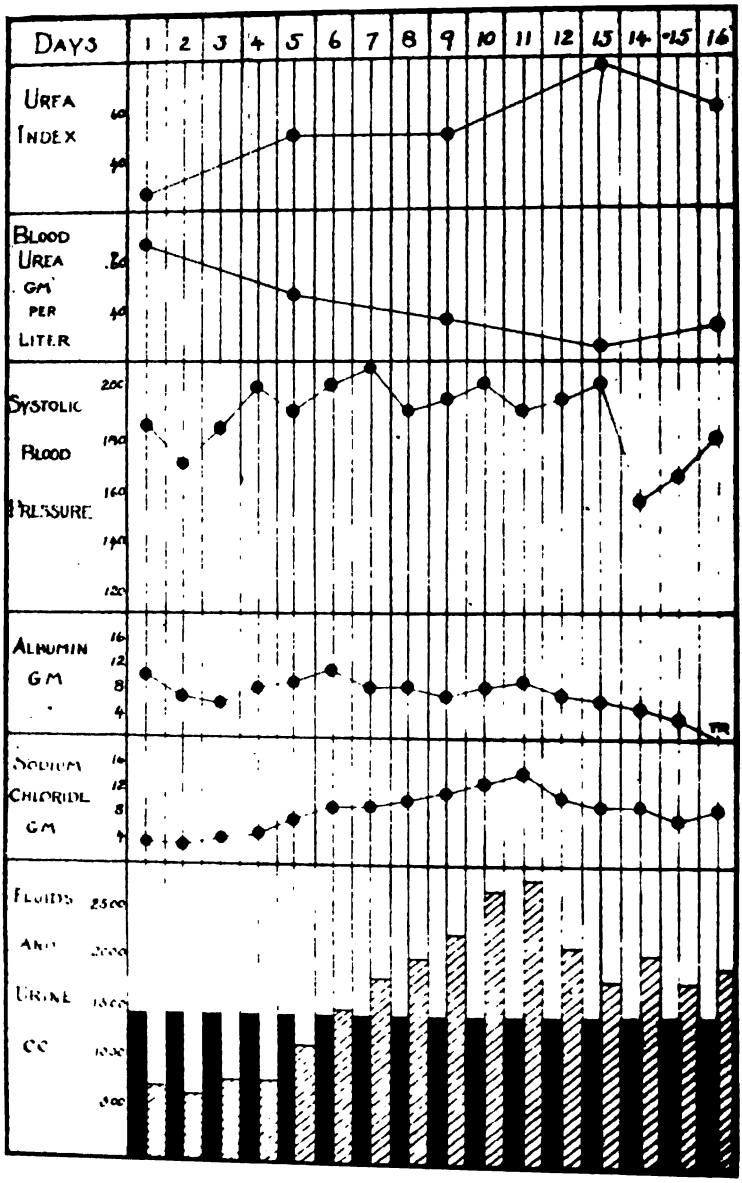

CHART II.

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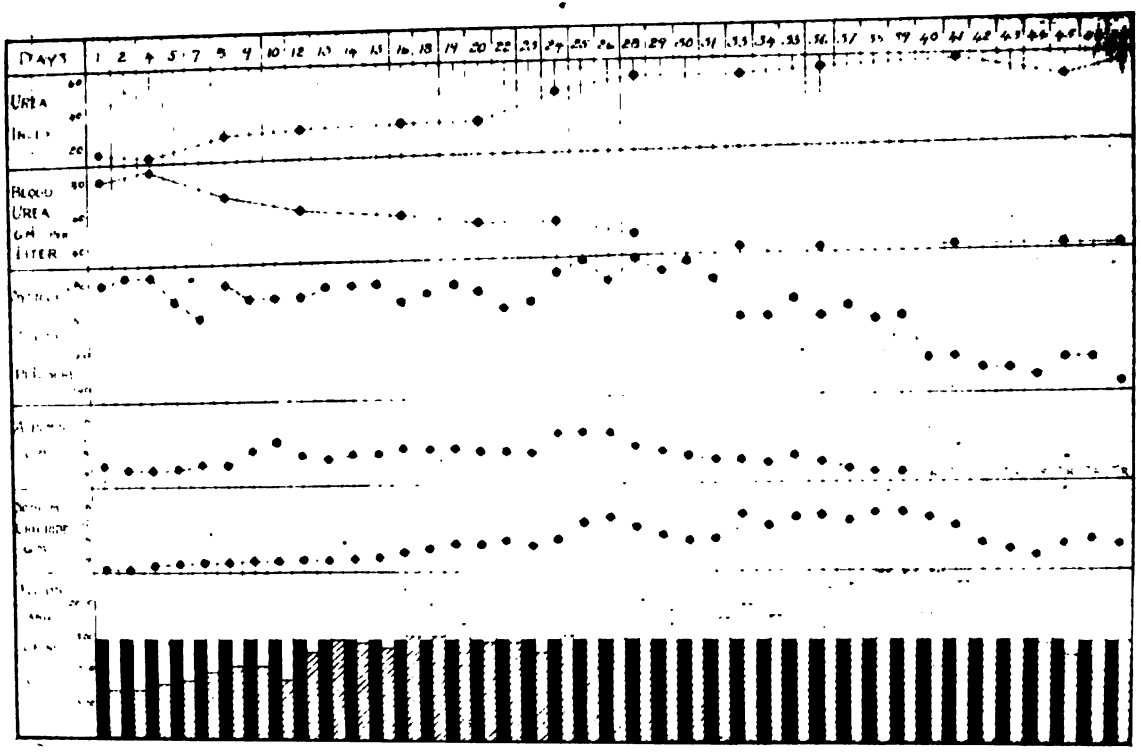

CHART III.

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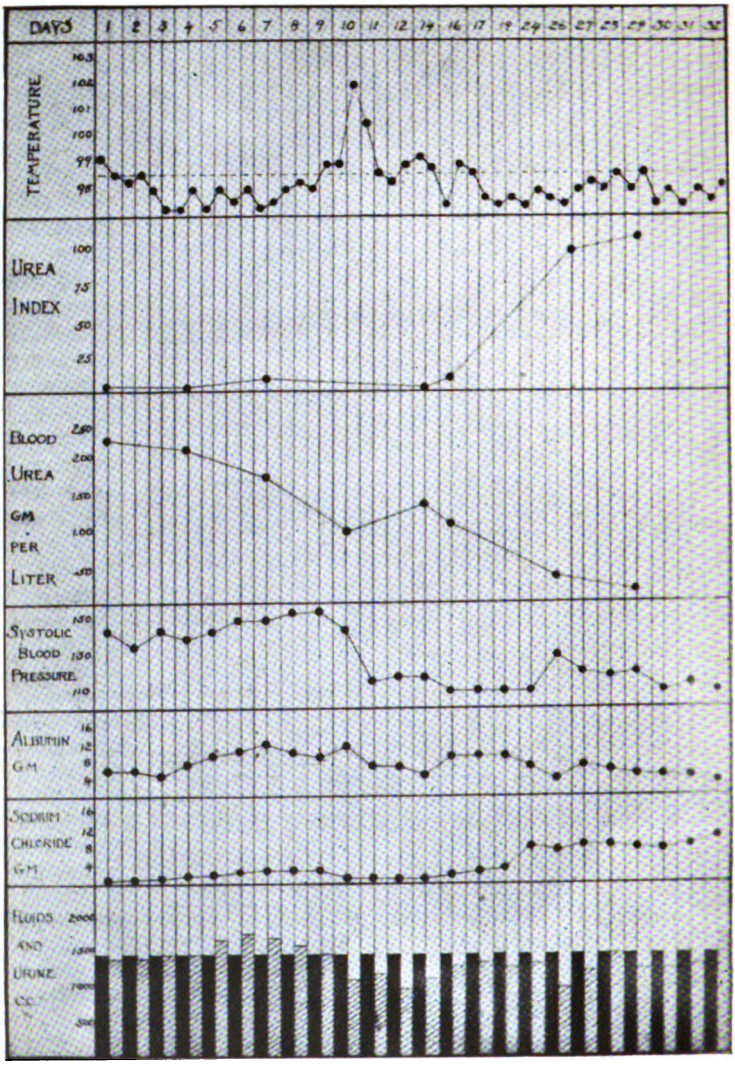

Chart IV.

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severe, the blood urea was increased and the urea index diminished. As the acute process subsided the blood urea and blood pressure fell, the albuminuria, hematuria and cylindruria diminished, and the kidney finally became permeable for water and salt. As a general rule excretion of albumin rose at the first signs of improvement and diminished when the most acute stage was past. At first the sediment contained cellular elements rather than casts, later hyaline casts in large numbers, and finally these disappeared entirely. Such a reaction suggested acute congestive nephritis, followed by desquamation, exudation, and eventually healing.

Three cases are cited to illustrate these features and to show the similarity of a mild, a moderate, and a severe case.

(See Chart I)

Private J. B., forty years old, entered the hospital on September 9, 1917. About a week before entry he had attacks of dull headache, swelling of the face and body and increasing dyspnea on exertion. Physical examination was negative except for edema of face, ankles and sacrum. The systolic blood pressure was 176 and the diastolic 90. The urine at entry had much albumin, blood, and relatively few casts.

As soon as the patient was put to bed and given restricted fluids there was pronounced and rapidly increasing diuresis, with establishment of normal water balance as the edema disappeared. The chloride output was high at first, later falling. The excretion of albumin increased during the first few days and fell off as the nephritis diminished. The blood pressure fell rapidly to normal. The blood urea was at no time much increased, but fell slightly, and the urea index, within normal limits at the first observation, rose after ten days.

(See Chart II)

Private P. J. W., thirty-three years old, entered the hospital on October 2, 1918. Except for measles and mumps in childhood he had always been well. During two and a half years of army life he had never reported sick. About September 20, 1918, he noticed swelling of his feet and face, dyspnea on exertion, and slight headache, without nausea or vomiting. He worked for six days after the onset of symptoms, but eventually was forced to give in. Physical examination was negative except for increased blood pressure (185 systolic and 95 diastolic) and for edema of the face, hands, sacrum and ankles. The urine contained albumin, blood and casts.

As can be seen from the chart, the findings were essentially those of the first case, except that the lesion seemed severer and the reaction slower. There was definite oliguria for four days, followed by diuresis reaching its height eleven days after entry, and persisting to a slight extent until discharge. The chloride output was low at first, but increased steadily with the water excretion and eventually approached a normal balance. The excretion of albumin was equally typical. With the beginning of improvement it increased, but later fell until traces only were excreted. The blood pressure remained persistently elevated, though on the last three days it tended to become lower. The blood urea concentration fell steadily, and at the same time the urea index rose from less than 30 to over 60.

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Private W. F. C., thirty-four years old, entered the hospital on January 21, 1918. About three weeks before he noticed dyspnea, edema of the face and ankles, and a persistent headache. He carried on for two weeks and a half, but finally had to give in. Physical examination was negative except for hypertension (systolic blood pressure, 200; diastolic, 90) and for marked edema of the face, legs and trunk.

Here again the findings were those of the other two cases, except that the process was slower. The patient was oliguric for twelve days and had no outspoken diuresis until the twenty-fifth day after entry. At the end of seven weeks in hospital he was still excreting more fluid than he was taking in, though he appeared to be free from edema.

At first he excreted only traces of chloride, but as the nephritis subsided and the diuresis developed he put out large amounts. The excretion of albumin rose at first and then diminished. The blood pressure was high for about a month, but later returned to normal. The blood urea fell after a slight initial rise and the urea index, at first very low, rose steadily.

PROGNOSIS

The most effective means for the immediate prognosis of trench nephritis seemed, as in chronic Bright's disease, the determination of the blood urea concentration or preferably the urea index, since the cases with a high blood urea and low index were always more severe than those with a low blood urea and normal index. Although no fatal cases were encountered, it is reasonable to believe that very high blood urea findings would occur with or without terminal convulsions and coma. The ultimate prognosis is less certain. By a "follow-up system" of letters it was possible to keep track of nineteen patients for periods up to fifteen months after the onset of illness. The results are tabulated according to the height of the blood urea concentration at entry. (Table IX.)

The patients were kept in hospitals for periods varying from five weeks to more than ten months before recovery took place. However, ten of them appeared to get over their nephritis entirely after prolonged rest and treatment, and only three were invalided out of the army as unfit. One patient died, but without any signs of nephritis; unfortunately no autopsy was performed. None of the cases seemed to show any chronic progressive downward tendency nor to be suffering from anything more than slow acute nephritis which was gradually subsiding. It seems justifiable to believe, therefore, that the disease, though a true nephritis, is mild and self-limiting, and that complete recovery occurs in the majority of cases. No relationship is demonstrable between the apparent severity of the disease at onset, as judged by blood pressure, urea accumulation or clinical symptoms, and the length of time necessary for recovery.

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TABLE IX

Name	Age	At entry		Duration of symptoms before entry	Length of hospital treatment	Disposal and notes
		Blood pressure	Blood urea gm. per liter			
G. B.....	40	166–90	1.34	1 week	3½ months	Still in hospital. Blood pressure 150. Urine has albumin. Slight persistent edema. (Not heard from since last note.)
A. E. W...	35	160–80	1.22	2 days	5 weeks	Well since discharge. No signs of persistent or chronic nephritis. (Heard from 12 months after onset of illness.)
W. F. C..	34	200–90	.82	3 weeks	10 months	Still in hospital and improving slowly. (Not heard from since last note.)
J. L. L...	36	180–80	.69	Unable to state	4 months	Invalided from army for chronic bronchitis. At discharge from hospital no evidence of persistent or chronic nephritis. (Not heard from since last note.)
R. W. L..	19	127–70	.55	1 day	3½ months	Perfectly well. No evidence of persistent or chronic nephritis. (Not heard from since last note.)
R. G. L...	24	173–100	.42	3 days	5 months	At discharge—Blood pressure 120-85. No albuminuria. Occasional cast and red blood corpuscle in urine. No evidence of persistent or chronic nephritis. (Not heard from since last note.)
H. H.....	34	196–110	.42	3 weeks	3½ months	Complete recovery from nephritis. Died 9 months after onset of nephritis from broncho-pneumonia. No autopsy. (Statement from patient's wife and officer in charge of case.)
H. H.....	27	138–90	.38	10 days	4½ months	Complete recovery. No evidence of persistent or chronic nephritis. (Heard from 14 months after onset.)
H. G. B..	39	174–94	.38	1 week	4 months	Complete recovery. No evidence of persistent or chronic nephritis. (Heard from 15 months after onset of illness.)
F. J.....	22	146–95	.36	1 week	2 months	Still in hospital but feels well and appears to be improving. (Not heard from since last note.)
J. B.....	40	176–90	.34	1 week	3 months	At discharge from hospital, no edema. Urine shows trace of albumin. (Not heard from since last note).
T. G.....	29	150–90	.33	1 week	6 months	Urine still has trace of albumin, but no blood or casts. (Not heard from since last note.)
J. N. P...	27	148–92	.30	2 weeks	4½ months	Complete recovery. No evidence of persistent or chronic nephritis. (Heard from 14 months after onset of illness.)
J. W.....	36	160–90	.30	3 weeks	?	Complete recovery in nine months. (Heard from 9 months after onset of illness.)
E. W.,...	27	128–86	.12	2 weeks	3½ months	Still has albumin in urine but no edema. Blood pressure not elevated. Apparently progressing favorably. (Not heard from since last note.)
T. J.....	33	178–110	.....	1 week	6 months	Invalided from army but at work and feeling well. No evidence of chronic or persistent nephritis. (Heard from 15 months after onset of illness.)
E. C. O...	36	153–80	.....	4 days	4½ months	Complete recovery. No evidence of persistent or chronic nephritis. (Heard from 15 months after onset of illness.)
W. S. A..	21	150–75	.....	8 days	5 months	Complete recovery. No evidence of persistent or chronic nephritis. (Heard from 6 months after onset of illness.)
A. E. P..	24	146–84	.....	10 days	6½ months	Discharged from army. Urine contains albumin and casts. Can do light work but has not recovered entirely. (Heard from 15 months after onset of illness.)

ETIOLOGY

The cause of the disease is unknown despite a mass of conflicting and indefinite evidence. In the majority of cases in this series, an infectious origin is suggested: seven patients entered with fever, the temperature returning to normal as the nephritis improved; in

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thirteen others fever developed during the stay in hospital, without physical signs; four cases showed definite febrile relapses. Keith and Thompson[13] have also called attention to the relapsing tendency of this type of nephritis.

Two types of relapse were encountered, one not associated with any demonstrable change in kidney function but accompanied by the typical shin pains of trench fever, the other showing impairment in renal function during the period of fever. A case illustrative of the latter type is quoted.

(See Chart IV)

Private P. N., thirty-two years old, entered the hospital on October 2, 1918. Remembered no serious illness; during nearly two years of army life he had reported sick only once and then had not been incapacitated for duty.

About two weeks before entry he noticed that his eyes were swollen in the mornings and a few days later swelling of the feet and ankles. At the same time he became increasingly short of breath on exertion and had considerable headache. He was admitted to a casualty clearing station, from which he was transferred to the base hospital. Physical examination was negative except for marked edema around the eyes, face, ankles and sacrum, and moderately increased blood pressure (145 systolic, 100 diastolic). The striking features of his case are shown on Chart IV.

At entry there were slight increase in temperature, a low urea index, high blood urea; urine was being passed in good quantity and contained considerable albumin and little salt. For the first few days he improved; the temperature became normal; the urea index rose; the blood urea fell; the blood pressure readings remained almost stationary; the excretion of water, albumin and chloride increased satisfactorily. On the ninth day, however, he apparently had a true relapse, shown by a "spiked" rise in temperature (with return to normal in five or six days), by a falling off in urine output with diminution in the chloride and albumin excretion, by a lowering of the urea index and by a rise in the blood urea concentration. Clinically, too, the man seemed worse, as evidenced by increased dyspnea, a return of headache, and concomitant nausea and malaise.

After the fever was over the nephritis tended to heal and the man was discharged convalescent. The blood urea fell rapidly to normal, the urea index rose, there was an initial rise in the excretion of albumin followed by a fall, the sodium chloride excretion increased, and there was a tendency for the excretion of water to rise, though the patient was evacuated before any outspoken polyuria occurred. The blood pressure fell rapidly when fever developed and remained low afterwards.

TREATMENT

The immediate treatment of the disease as outlined was logical and efficacious. Since water retention, chloride retention and urea retention were all demonstrable, restricted intake of fluid, chloride and protein was indicated. An important feature of this simple

[13] Keith and Thompson. Quart. J. Med., 1918, xi, 229.

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treatment is the insistence on absolute system and regularity in feedings. Each patient was regularly given the same amount of fluid at the same time each day. Food was added cautiously and according to established routine. In this way, it was thought, any undue stimulus to metabolism was avoided, and the damaged kidneys were given a chance to become readjusted. Sweating and purgation were not attempted because the cases did so well without such uncomfortable measures. Diuretics were tried in a few cases but with most indefinite result. Alkalies did not seem indicated, as the acidosis was never sufficient to produce symptoms.

Bleeding proved very effective in the cases with convulsions. It must be mentioned, however, that the patient from whom 50 c.c. of blood were withdrawn responded as well and quickly as another from whom 1,000 c.c. were removed.

On the whole this simple treatment at the outset gave gratifying results. Since the cases required hospital care for intervals up to ten months from the onset of symptoms, it would seem that the ultimate treatment is equally important. The patients should be treated and managed as cases of chronic nephritis until all evidence of the acute process is over. They should not be discharged from the army nor be considered hopelessly ill until they have been under observation for a long time.

CONCLUSION

Trench nephritis is a type of acute nephritis of unknown origin occurring among troops. It is characterized by the rapid subsidence of well-marked renal dropsy, the frequent presence of bronchitis and dyspnea, the suddenness of onset of uremic manifestations, the rarity of occurrence of inflammatory complications, and by an extraordinarily low mortality.

It accounts for about 5 per cent of the medical admissions to a general war hospital and is strikingly more frequent than acute nephritis in a general civilian hospital.

It occurs most commonly among relatively older soldiers who have seen service for short periods of time. It occurs to a less extent among the younger and more seasoned troops. It appears to be pandemic and not limited to any single group or groups of soldiers.

The dyspnea is not due to acidosis, though slight acidosis is common. Urea retention is found in the majority of cases and is most marked in the severest. The edema is intimately related to chloride retention and is independent of high blood pressure, albuminuria, or urea retention. Epileptiform convulsions occur in rel-

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atively mild cases without markedly abnormal kidney function and are not associated with urea retention, oliguria, or anuria. Cases complicated by convulsions usually have hypertension of varying degree, and all show more or less chloride retention. It is possible that the convulsions are not "uremic" in nature, but depend upon some circulatory disturbance or cerebral edema.

Fever at onset in seven cases suggests an infectious origin, an impression confirmed by the tendency to relapse. Two types of relapse are encountered, one febrile in character and associated with symptoms of trench fever, the other having in addition to fever a definite impairment in renal function.

The immediate prognosis of trench nephritis is most accurately obtained by determining the accumulation of urea in the blood and the urea index. These vary from normal in direct ratio to the patient's condition, tend to approach normal as the albuminuria and hypertension diminish, but are independent of edema and chloride retention. The ultimate prognosis of the disease is less certain. No relationship is demonstrated between the apparent severity of the disease at onset (as judged by functional tests, physical signs and clinical symptoms) and the length of time necessary for recovery.

The indications for treatment depend upon the abnormalities in function. As edema is associated with chloride and water retention, and the severer cases with urea retention, it is reasonable to restrict fluid intake and to give diets low in chloride and nitrogen.

When the blood urea concentration has become normal and the edema has disappeared, cases should be managed as cases of chronic nephritis and observed carefully until they are well.

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SOME OBSERVATIONS ON THE SUSCEPTIBILITIES OF THE RECRUITS TO DISEASE

By Lieutenant Colonel GEORGE DRAPER

Medical Corps, United States Army

THE following report embodies the results of an investigation of the pneumonia at Camp Funston during April and May, 1918. Immediately after a severe dust storm about a month before this study was begun, there had been a large number of cases diagnosed as influenza, many of which developed pneumonia secondarily.

There seemed to be little doubt in the minds of the physicians who had seen the cases that the malady in question was true influenza. The clinical picture was typical, and the course of the epeidemic wave followed the usual sharp curve so characteristic of the disease. Bacteriological studies, however, had not been made consistently with special reference to the epidemic, though it was reported that on many of the blood agar plates taken from cases by throat swab, to determine whether or not the *Streptococcus hemolyticus* was present, there appeared frequently numerous small colonies of Gram negative bacilli.

It seemed advisable, therefore, to prepare to make a careful study of any new cases that might develop, both by throat swab and blood culture. After a preliminary survey of the situation the following report and plan for procedure was presented to the division surgeon, and by him to the Commanding General.

Abstract of Report

1. There is a minimum of cases of primary fixed type pneumococcus pneumonia.

2. There is much pneumonia, however, with a varied bacteriology, chiefly Pneumococcus Type IV (bile soluble) and *Streptococcus hemolyticus*.

3. Further study of this confused bacteriology appears futile at this time, because here, as well as at other camps, much excellent work has demonstrated the same confusion of organisms in cases clinically recognized as pneumonia.

4. Recently there has been at this camp a large number of cases, showing a striking clinical similarity, which have been called "Influenza." This term implies the presence of *B. influensae* and is therefore confusing because that organism has not been shown to be the causative agent. The term "X" Disease is therefore temporarily substituted.

5. The symptoms of the malady are: Sudden onset of feeling "all in," *i.e.*, prostration; headache, aching bones and muscles; chills and fever from 99.5° to 102° or 103°. There is striking absence of pharyngitis or other involvement of the respiratory mucosa. Most of these cases recover in 48 hours. The more severe ones, whose temperature is 102° or more, seem to be those which subsequently develop pneumonia.

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6. Outbreaks of this malady apparently follow fatigue and exposure to high wind and dust. Note in this connection the experience of Co. C, 355th Infantry, which follows.

Company C, 355th Infantry, received about the end of March 172 new men from their three weeks' initial stay at the incoming detention camp. On April 8, cases of "X" Disease began to appear among the men in increasing numbers. On April 10, drill work for the company was cut out entirely and for four days the men were confined to barracks. The accompanying table indicates the course of the epidemic, and the apparent influence upon it of the rest period:

COMPANY C, 355TH INFANTRY

Table Showing Incidence of "X" Disease and its Relation to Fatigue and Rest

Date	*Admissions*	*Company activities*
April 7.....	0	Regular drill.
April 8.....	3	Regular drill.
April 9.....	10	Regular drill.
April 10.....	14	No drill; confined to barracks.
April 11.....	8	Do.
April 12.....	1	Do.
April 13.....	1	Do.
April 14.....	2	Do.
April 15.....	1	Regular drill.

As a demonstration this is striking, but of course is impractical from the military viewpoint. However, it points in the direction of an attempt to strike the proper balance between overwork, which defeats its own intended object of rapid preparation, and the other equally retarding influence of too gentle management.

It is suggested, therefore, that just as laboratory experimentation has been furthered to develop methods of epidemic prevention and control, so there be established a field experiment station, involving a typical training unit for the development of training methods which combine all the elements making for the most rapid production of high military efficiency.

As a result of the experiment of the 355th Infantry, General Wood ordered that the new recruits, who were due at this time, should be given less strenuous training than their predecessors at the Detention Camp. This practically provided the experiment station suggested in the report just quoted. Fortunately a valuable accident provided a remarkably good control element. This was the large-sized draft which made it necessary to provide two main sections, one of 6,500 men, and the other of 3,500, housed under the same conditions but in two widely separated camps, each under a different commanding officer.

While the Drill Schedule provided for the entire draft was the same at each camp, the local commander at each place varied the plan considerably in accordance with his views on the handling of recruits. Both commanders coöperated to the fullest extent with the office of the camp surgeon during the investigation.

The two main points of variance between the management of the men at the two camps were, first, that at Camp Pawnee the recruits

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were held two to four days on arrival before passing through the receiving station, owing to the great congestion at that place; and second, the drill schedule at Camp Pawnee was practically cut in half. Furthermore, at this camp there was no heavy fatigue work required of the men in addition to the drill. In other words, at Camp Pawnee the men were broken into their new environment by degrees (this accidental because of the congestion at the receiving station), and they were not worked so hard by one-half as were the men at Camp Republican, where the prescribed schedule was adhered to much more closely. It should be mentioned here that this schedule was in itself much lighter than any previous one had been.

The actual study of the new recruits began at the Receiving Station, where they were watched and questioned at various stages of their progress from the moment of arrival in citizen's clothes to the time of their completion of the fourteen days at the Detention Camp. The trains bringing the men arrived at all hours of the day and night, and many of the men not only said they were, but obviously were, tired by the long journeys in the crowded cars. In the case of the first 6,500 men of this draft no time was lost in sending them through the "system" on their arrival. The process of turning a recruit out of his civilian clothes, washing him, examining him, inoculating him with T. A. B. and smallpox vaccine, and finally equipping him piece by piece till he steps forth completely uniformed consumes two hours and a half. During this time the men are in a constantly but slow-moving line, a large part of the period naked, and are kept constantly on the alert for each new process. It is a very exhausting process at any time, but especially so at the end of a fatiguing journey. Several men each day faint during the procedure. Of course the so-called "psychic effect" of the new experience is usually given as the explanation for these cases, but it all represents the varied expression of strain and fatigue.

To the casual observer it is quite apparent that the physical condition of the men as they file past, stripped, is poor. Many have been office workers or indoor salesmen, and their pale skins and flabby tissues bespeak lack of tone and indicate the absence of any kind of exercise.

From the receiving station the recruits were driven 5 miles to Camp Republican, their new quarters. Many of the men found it difficult to sleep well the first night owing to the strangeness of the place, and because often the onset of the reaction to the two vaccinations had begun.

The orders were that no man should be given any drill for the first twenty-four hours after entering camp, but during the day following arrival there was often much policing of the grounds, and at first, at Camp Republican, the men were set to carrying rock down from the hillsides to make paths in the camp.

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Several individuals so occupied on their first day after arrival were stopped in their work and observed. They were allowed to rest until all exertion dyspnea had passed, and then pulse rates were taken. The following table shows the findings (occupation and pulse rate) on men taken at random from several groups: Druggist, 148; bookkeeper, 168; salesman, 128; foundryman, 100; stationary fireman, 132; dishwasher, 120; driver, 122. The above remarks have been made in order to indicate the kind of material which was being handled in the recruit camps and the events which occurred in such rapid succession in the first few hours of the transformation from civilian life to that of the soldier.

The recruits were then followed to the drill field and observed during practically the whole of each day for the next three or four days. In the aggregate the men seemed to be going through with the day's work well. Many individuals were observed, however, who had the hot, slightly bluish-red high color of the person who exercises too hard on the first day of his summer vacation.

On the third and fourth days after arrival men began to report sick, and on May 2, the fifth day after the camp started, there was a great increase in the number of sick. The diagnosis of most of the cases was "Influenza."

The similarity of all these cases was so striking that there was little question that they were of like nature. They resembled, too, the description given of the patients from the 355th Infantry. There was considerable variation in severity, ranging all the way from mild general malaise without fever to extreme forms with temperature even as high as 106°.

Subjectively the patients all complained of headache and great prostration. Very many had pains across the lower part of the chest anteriorly, frequently associated with a sensation of constriction in the throat or larynx. General malaise with "pains all over" was common to almost all, and many were constipated. Pains in the lumbar region were also frequent.

Objectively the patients presented a most characteristic appearance. The face was flushed, often looking fiery red. In addition to the high color, definite puffiness, and in some cases actual swelling of the skin of the face, was present. A particularly constant phenomenon was the puffiness of the soft tissues beneath the supraorbital arches, above the upper eyelid. The lips were swollen and shiny, and in one or two instances patients remarked that their faces were all swollen up and that their heads felt like two. The veins over the scalp were frequently engorged. The buccal and pharyngeal mucus shared in the general congestion of the face and head, but rarely appeared to be the seat of an acute infection.

The lungs in most cases were clear and cough absent. Where there

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were fine râles or bronchial squeaks, and a cough, it usually turned out that the patient had had a cold before coming to camp. The heart showed no change. The abdomen was often tender, especially over the liver region. The spleen was easily felt in almost all cases, and frequently was definitely tender.

The temperature varied from normal or 99 in the mild forms to 102°, 103°, 105°, and in one instance 106° in the more severe. The pulse was definitely slow in proportion to the height of the temperature, ranging between 70 and 100 or 110. The respiration not infrequently was labored and irregular, never rapid.

The duration of the acute symptoms was between 36 and 72 hours. Many cases with high temperature cleared up with amazing rapidity when put to bed, with no other treatment than catharsis and a little aspirin. But, following the acute attack, the patient feels weak for several days. Several instances occurred where men who had recovered promptly from the attack fell down or fainted at drill on one of the ensuing days.

Most of the cases occurred on the second or third day after the T. A. B. and smallpox inoculation. Some, however, did not appear till the sixth or seventh day. These delayed reactions were frequent.

Below are given several examples of the disease:

Case 1.—Taylor, Maurice H. Rct. Co. 27, 164th Depot Brigade. April 30, received T. A. B. (1) and smallpox vaccine in the evening. May 1, was drilled in the morning and had lectures in p. m. May 2, drill as prescribed. May 3, began with headache and slight cough, at 10 a.m. In the p. m. general malaise and body pains. Patient says that his face is swollen and that his head feels "like two." He is very flushed, veins distended, and eyes injected and the circumorbital tissues puffy. Spleen palpable and soft like a typhoid spleen.

Case II.—Parsons, Wm. Rct. Co. 27, 164th Depot Brigade. April 29, received T. A. B. (2). May 2, began in the morning with headache, "sore lungs," nose stuffed up, slight cough (had cold on leaving home), constipation. May 3, very intense injection of eyes and face, with puffiness. Felt better in p. m. although he vomited. May 4, pt. much better, eyes less red. Slight cough. T. 99. May 5, recovered.

Case III.—Gruber, Wm. L. Rct. Co. 41, 164th Depot Brigade. May 4, received T. A. B. (2). May 5, lay about feeling badly. May 6, felt badly but went to drill in a. m. In the p. m. felt too ill to drill and again lay down in tent feeling very sick. May 7, admitted to field hospital. Face deeply flushed, eyes puffy and injected. T. 104, P. 100, R. 20 labored. Lungs clear, no cough, spleen palpable and soft. May 8, feels much better. Less red and puffy. T. 108.4, P. 98. May 9, patient sent to base hospital. T. 104, P. 100. Dulness at rt. base post., with slight change in quality of breath and voice. May 10, patient much better. T. 99.4, P. 104, R. 28. Signs in chest cleared.

This is an example of a large group of cases which were sent to the base hospital with the diagnosis of pneumonia. It is interesting to note in this connection that there appears to be some discrepancy between the severity of the acute attack under discussion and the liability to develop pneumonia. Thus of many true pneumonias in the

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hospital questioned on this point, many stated that their T. A. B. reactions had been insignificant. On the other hand, all the severe cases of the "X" reaction cleared up with amazing promptness. At most they seemed to develop pleurisy or acute bronchitis. A field hospital was established at Camp Republican, where the cases of "X" disease were put instead of sending them to the base hospital. The patients cleared up remarkably quickly in the tent hospital.

Bacteriological examinations of these cases were made in 21 instances. Blood cultures in all 21 by aerobic method, and by anaerobic method in 17, were all sterile. Throat cultures made on blood agar plates from 17 showed in 15 the normal and usual mouth flora. In one case the *Streptococcus hemolyticus* and in another a doubtful *B. influenzae* were found.

An attempt was made to determine by varied rest periods in different companies whether fatigue, added to the combined typhus and smallpox vaccinations, increased the number and intensity of the "X" reactions. With this object in view, one company, selected at random, was given 48 hours' rest following the second T. A. B. injection. But the subsequent study of the company and its control group, which had had 24 hours' rest, was most unsatisfactory. The men found out that some sort of observation was going on, and the company having 48 hours' rest believed that they had received double the dose. Furthermore, different organizations rapidly developed what might be called a "company style." Some would get the idea that it was bad form to say when they felt sick in answer to a question on the field, etc. Others tended to exaggerate their sensations. The number of sick calls on the two or three days following the injection in each of the observation companies was about the same at Camp Republican, but at Camp Pawnee the 48-hour company had many fewer sick.

A far more striking demonstration of the difference between the two camps is to be found in the following table (see page 106) showing the total sick sent to the base hospital, field hospital, and to quarters during the period of stay at the detention camps.

Most of these cases were of the type described above. Now, what the relation of this condition may be to the appearance of other diseases is difficult to prove absolutely. But it is worthy of note that of the 57 consecutive cases sent to the hospital during the ten days after the recruits came in with the diagnosis of pneumonia, 41 were from the detention camps. At least 10 of these turned out not to be pneumonia, but pleurisy or bronchitis following in the course of one of the "X" reactions.

A study of the mouth flora of these 57 cases showed that on admission to the base hospital 42, or 74 per cent, had normal flora, and 15, or

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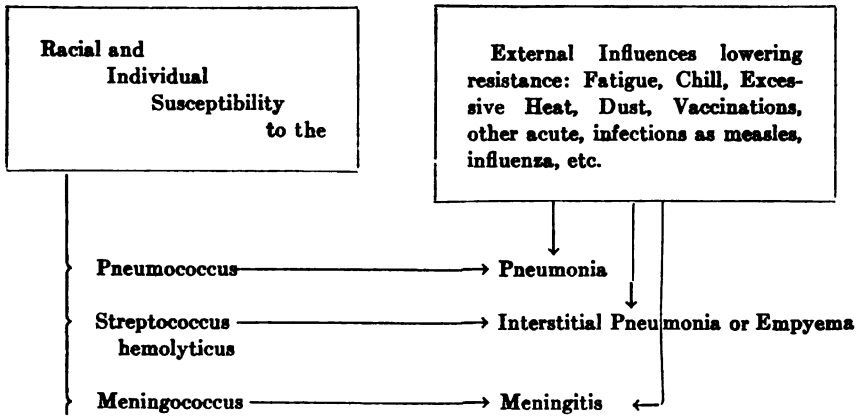
26 per cent, harbored *Streptococcus hemolyticus*. Further complete report on this bacteriological work will be made shortly by Lieutenant Berry, M. R. C.

Two cases of other infectious disease arose in the wake of the strenuous first days and following the "X" condition. One of these was what appeared to be the return of an old gonorrheal joint. Many individuals who arrived with "colds" and coughs were observed to experience aggravations of these minor ailments.

The question therefore naturally arises, "Does the combined effect of fatigue, new environment, and the two inoculation specifics so reduce the recruit's resistance that existing infections flare up and exposure to new ones start the epidemic disease which has killed so many in the past year and so materially interfered with the training program?"

In answering this question the following diagram may be of some assistance in approaching the problem "recruit and epidemic disease," based on the observations recorded above:


Racial and Individual Susceptibility to the
External Influences lowering resistance: Fatigue, Chill, Excessive Heat, Dust, Vaccinations, other acute, infections as measles, influenza, etc.
Pneumococcus
Pneumonia
Streptococcus hemolyticus
Interstitial Pneumonia or Empyema
Meningococcus
Meningitis

It is impossible to measure the importance of any of the factors involved in the above schemes, but there is little doubt that they are all important and all variable. Some of them are susceptible of absolute control. Up to the present time the attention of the medical profession has been directed intensively to the offending germ. No bacteriologist fails to prepare with the greatest accuracy the media on which to grow the organisms he is studying, and it is common knowledge that the minutest change in artificial media will make the difference of a meager or a luxuriant growth. After watching the preparation of recruits it became obvious that little attention was paid by the higher authority to the condition of the human media, notwithstanding repeated and urgent recommendation by the Medical Department.

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Date	Republican			Pawnee	
	B. H.	F. H.	Qts.	B. H.	Qts.
April 27	0	.....	.....	.....	.....
28	2	.....	.....	1	.....
29	4	.....	.....	3	.....
30	9	.....	.....	5	.....
May 1	8	.....	.....	3	.....
2	48	.....	27	7	1
3	51	.....	27	3	1
4	8	.....	15	4	1
5	18	.....	10	8	5
6	13	22	24	9	3
7	4	9	4	13	2
8	4	22	7	12	4
9	4	13	5	10	0
10	8	12	4	7	1
11	11	6	8	4	2
12	9	7	4	4	0
13	.....	.....	.....	2	0
14	.....	.....	.....	4	0
15	.....	.....	.....	7	0
16	.....	.....	.....	5	0
	Total: 427, or 6.5%.			Total: 131, or 3.7%.	

RECOMMENDATIONS

(*a*) That recruits be given three to four days on first arriving in camp during which they have no drill or other hard work, and so have an opportunity to "find themselves."

(*b*) That the physical work be developed at a proper rate, as in the training of athletes.

(*c*) That the T. A. B. series and the smallpox vaccination be separated by at least two weeks.

(*d*) That the whole period of inoculation be regarded as one in which the body is being called upon for a severe biological effort. Consequently all other effort, both mental and physical, should be reduced to the minimum.

(*e*) That recruits should not be expected to reach a point where hard work on full time is possible for at least a month. Drafts should be made sufficiently far in advance of the time at which they will be needed as troops, so that this month can be allowed for in the prescribed course of training.

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"BLADDER STUTTERERS"

By Captain ROBERT L. HOFFMAN, M. C., U. S. A.
Genito-Urinary Section, Camp Logan, Texas

THE question of nocturnal enuresis in the Army, in contrast to that of civil practice, is one which deals with the young adult rather than the thoughtless child, since enuresis in children is rare after the age of ten years, when the sense of personal pride and the mental attitude tend toward attained correction by proper control of this apparent defect.

The army cases necessarily are those which failed to develop this control through lack of a sense of pride, or other inattention, as the child developed and can be classified into coöperative—those who desire to correct the defect—and the antagonistic, those who are seeking the S. C. D. route from service. There must, of course, be many malingerers, since there is no reason why nocturnal enuresis in the Army should outweigh that of civil life, although the concentration of a great number of men would necessarily make the actual percentage of cases appear higher than would occur in civil practice.

During March, 1917, a true case of nocturnal enuresis was discharged from the service by the S. C. D. route at Camp Logan, Texas, and this case precipitated an enuresis epidemic. These cases were admitted and were very obliging and consistent in their "efforts at nocturnal urination." However, on being called to stand at their beds at 5 a. m. one morning for "pajama inspection," there was a noticeable preponderance of dry pajamas over that of corresponding wet beds, showing a voluntary urination in bed not discomforting to the patient. This, of course, necessitated an effort to classify the true from the malingering enuretic. There are certainly some cases of true enuresis, and these deserve a careful routine examination, complete in each detail. These examinations were uniformly negative of apparent pathological cause for enuresis. True, some cases show a small urinary meatus or a pouchy urethral orifice, but they are foreign to the case, as is the small capillary naevus among "rose spots" on an abdominal wall in typhoid fever.

During the epidemic an intensive treatment was instituted of passing hot sounds, which resulted in a high percentage of admitted cures and a consequent return to duty; the sacral injection of 0.5 per cent sodium chloride solution was also used, with good results, in doses ranging from 2 to 6 c.c.; the technique being surgical antisepsis and the careful location of the sacral foramenae with the point of the needle, then inserting and

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turning the needle point up in the long axis of the body, and entering the sacral canal; in other words a sacral "spinal puncture." The danger to the cauda equinae is a minimum one, but should be borne in mind for any extra manipulations after the needle has been inserted. The cases for this treatment are of course selected from the antagonistic class from whom no coöperation can be obtained, and should not be repeated more often than once in five days.

In those remaining cases where the condition exists through the patient's mental inaction but willingness to coöperate, the following method of suggestion has been successfully used and is advocated for all cases of enuresis where the patient desires to attain a cure. As the stuttering, self-conscious person can be so trained that he gradually regains control of irritable muscles of phonation and eventually speaks with but little impediment, so can the enuretic with his "stuttering bladder" soon regain control of the detrusser and sphincter muscle balance.

The procedure is as follows: The patient is admitted, bathed, and given a complete clean outfit before any examination is made. After a careful history is completed he is given a careful examination and a lecture on personal hygiene. He is told the actual condition outlined above, as we see enuresis, and is then put into a standard hospital bed on a regular diet, but cautioned that an excessive fluid intake after 4 o'clock in the afternoon will cause a late frequency of urination which can be obviated by restricting or completely abstaining from any liquid with the evening meal. The absolute absence of any medication is emphasized, since these men have spent their entire lives taking quack as well as ethical treatment. He is warned that, if the bed be wet during the night, the treatment will change to an iron cot with a straw tick in place of the standard bed and mattress, and also that he will be called and compelled to go to the toilet every hour during the night, with a subsequent reward of being called every two, three, four or six hours until he is able to awaken from the symptoms of a full bladder, and so void voluntarily.

The following brief history of one such case, as taken from the records of a series as treated at this hospital, exemplifies the results we have obtained:

Case History.—J. J. C., Reg. No. 21390x, Pvt. Co. 1, Dev. Bn. No. 1. Admitted to Base Hospital, October 30, 1917.

Diagnosis.—Enuresis, Nocturnal congenital nonvenereal old. LOD No. E.P.E.

Family History.—One sister who had nocturnal enuresis, but gained control before the age of twelve years with no treatment.

Past History.—Parents resorted to the professional care as well as the proprietary preparations for the control of this condition; but patient says the only benefit derived was as a result of restricting the fluid intake after 4 p. m. Patient had measles at the age of ten years but noted no effect on the enuresis. Patient ad-

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vanced in his school work to the completion of his first year in high school, with no failures.

The physical examination was negative, and the cystoscopic examination revealed no pathology or congenital defect. Microscopic and quantitive examination of the residnal, total, and individual urines gave no clue to a pathological condition. The patient was then instructed as above and put under observation with following results:

Observation.—Standard bed and mattress. First night bed and pajamas wet; second night bed and pajamas wet.

Treatment.—Iron cot with straw tick. Four nights called every hour and sent to toilet; eight nights called every two hours and sent to toilet; three nights called every three hours and sent to toilet. November 18: Bed and pajamas wet at 3. a. m., but awakened in time to regain control. Two nights called every two hours and sent to toilet; six nights called every three hours and sent to toilet.

November 27: Bed and pajamas wet at 2 a. m., but again awakened and controlled. One night called every hour and sent to toilet; one night called every two hours and sent to toilet; four nights called every three hours and sent to toilet; four nights called every four hours and sent to toilet; two nights sleeping all night in iron cot; eight nights sleeping all night in standard bed.

Discharged to duty and at the end of 80 days has had no relapse.

Summary.—(1) Absence of any pathologic lesion for enuresis; (2) the futility of medication; (3) response to psychotherapy.

NOTE BY THE EDITOR.—We publish in the Apri number an article by Capt. Ivy Albert Pelxman, M. C., U. S. Army, entitled "New Cystoscopic Finding in Cases of Enuresis." It seems to us that article printed above is of interest as showing the variety of opinions which exist in regard to a not unusual condition in the service.

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EDITORIAL

THE RATE OF TRAINING

"Let us cross over the river, and rest under the shade of the trees."—*Stonewall Jackson.*

The attention of our readers is called to the article on "Susceptibilities of Recruits to Disease," by Lieut. Col. George Draper, M. C., on page 99 of the current number of THE MILITARY SURGEON. The category of "susceptibility diseases" is a concept which has been introduced into medicine by recent experiences in camps and training areas. Long before the recent European war, the problem of the deliberate regulation of the early phases of intensive military training was carefully considered, from the angle of the professional physiologist, by the late Sir Lauder Brunton, in his "Essays on Physical and Military Training" (1898–1915), of which a full account was rendered in THE MILITARY SURGEON (April, 1917, pp. 369–377). As stated, Brunton's conclusions were substantially "that intensive training of miscellaneous groups of men in military camps should be carefully graduated from the start; that, where time presses, large groups of men should be classified according to their relative stamina; and that the exercises should be designed to put many muscles into action by alternate contraction and relaxation of different sets, in order to get maximal results and avoid the possible production of neurasthenics, myasthenics and cardiac defectives, since these people are liable to denounce the whole scheme of training when they leave camp." Observers in our training camps also state that increased susceptibility to certain infectious diseases, particularly the infections to which infancy is liable, may be induced in raw recruits by overexercise, overstimulation, and overwork at the start. It would appear that overtraining may actually reduce some raw recruits to an infantile condition as far as susceptibility to disease is concerned. The large armies necessary for successful military operations in modern warfare have to be recruited from all grades, stations and occupations of civil life, often, as Lieutenant Colonel Draper points out, from "office workers and indoor salesmen," whose "pale skins and flabby tissues bespeak lack of tone" and "the absence of any kind of exercise." Most of our city-bred recruits are, in fact, drawn from this class, but, at the final showdown, the country lad is not much better off, and the city man, when he becomes a husky, usually distances him in ultimate endurance of fatigue and hardship, as also in resistance to disease. The problem, then, is to convert the recruit into a husky in the shortest possible

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time. Now, two important facts are brought out by intensive training. One of these, the business feature of outdoor sanitaria and a commonplace of all military training, is that the muscular flabbiness, indigestion, lowered vitality and lowered resistance of the tired-out business man of the cities and the jaded *viveur*, who has trod the primrose path and heard the chimes at midnight, are best corrected, not by the Weir Mitchell treatment, in cotton batting, but by full-time exercise in the open air, for a definite period. The other, a commonplace of all physical training of oarsmen, pugilists, and other athletes, as well as of soldiers, is that such exercise should be graduated and regulated from the start if it is not to defeat its own object. Obviously, the athlete who is trained too rapidly or overtrained at the start will encounter holes in the air, lose his grip, lose his nerve and not get his second wind on occasion.

In the various training manuals, as well as in most of the well-known manuals of military hygiene, ample provision is made for the gradation of physical exercises, the resting of marching and working men and the avoidance of overexertion and fatigue. All that is necessary is that these directions be carried out by commanding officers. Through the courtesy of Maj. William Roberts (Office, Chief of Staff), the following excerpts have been made available:

In the Manual for Physical Training (1914) we find the following:

(Pages 9 and 10)

"The question of the *Physical Aptitude* and *General Condition*, etc., of the men is a very important one, and it should always determine the nature and extent of the task expected of them; never should the work be made the determining factor. In general, it is advisable to divide the men into three classes, viz., the recruit class, the intermediate class, and the advanced class. The work for each class should fit the capabilities of the members of that class, and in every class it should be arranged progressively."

". . . The time of day, too, is important. When possible, these drills should be held in the morning about two hours after breakfast, and at no time should they be held immediately before or after a meal."

(Page 18)

"It should be constantly borne in mind that these exercises are the means and not the end; and if there be a doubt in the mind of the instructor as to the effect of an exercise, it is always well to err upon the side of safety. *Underdoing is rectifiable; overdoing is often not.* The object of this work is not the development of expert gymnasts, but the development of physically sound men by means of a system in which the chances of bodily injury are reduced to a minimum. When individuals show a special aptitude for gymnastics they may be encouraged, within limits, to improve this ability, but never at the expense of their fellows."

"Short and frequent drills should be given in preference to long ones, which are liable to exhaust all concerned, and exhaustion means lack of interest and benefit. All movements should be carefully explained, and, if necessary, illustrated by the instructor.'

"The lesson should begin with the least violent exercises, gradually working up

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to those that are more so, then gradually working back to the simpler ones, so that the men at the close of the drill will be in as nearly a normal condition as possible."

(Page 14)

"Never exercise the men to the point of exhaustion. If there is evidence of panting, faintness, fatigue, or pain, the exercise should be stopped at once, for it is nature's way of saying 'too much!"

(Page 15)

"Never exercise immediately after a meal; digestion is more important at this time than extraneous exercise."

Infantry Drill Regulations (1911), Paragraph 625, reads: "With new or untrained troops the process of hardening the men to this work must be gradual. Immediately after being mustered into the service the physical exercises and marching should be begun. Ten-minute periods of vigorous setting-up exercises should be given three times a day to loosen and develop the muscles. One march should be made each day with full equipment, beginning with a distance of two or three miles and increasing the distance daily as the troops become hardened, until a full day's march under full equipment may be made without exhaustion."

Paragraph 630 reads: "A halt of 15 minutes should be made after the first half or three-quarters of an hour of marching; thereafter a halt of ten minutes is made in each hour. The number and length of halts may be varied, according to the weather, the condition of the roads, and the equipment carried by the men. When the day's march is long a halt of an hour should be made at noon and the men allowed to eat."

Cavalry Drill Regulations (1916), paragraph 17, notes that these drills should be frequent but short, and paragraph 35 states that short and frequent drills are preferable to long ones, which exhaust the attention of both instructor and recruit.

Paragraph 96 of Field Service Regulations (1914) states that "while conforming to other requirements, marches are continued so as to reduce to a minimum the hardships of the troops, also, that men are not kept under arms longer than necessary, nor required to carry heavy burdens when transportation is available. Provision for halting on the march (Paragraph 102) and resting during the hot weather (Paragraph 104) evidences the same considerate attitude toward men on military duty, and the conclusion of the whole matter, as far as U. S. Army Officers are concerned, is given in Paragraph 245: "Lack of sufficient rest renders troops unfit for hard work and *diminishes their power of resisting disease.* Therefore, commanders should secure for the troops, whenever possible, their accustomed rest."

In the light of the above, there is evidently no new discovery under the sun and, from the strictly military point of view, Colonel Draper's proposition that the recruit be given three or four days of inactivity in order to find himself in camp, and that full-time hard work is not advisable inside of a month's time, is probably a bit exaggerated. During these first three or four days, the recruit is, in effect, engaged in finding himself in and about the camp, but the time should not be entirely wasted. Setting-up exercises and short marching exertions can surely do no harm. In grading physical exercise in recruits, much, of course, depends upon the climate and sanitary conditions of camp sites, the proper selection of which, in advance, is the first step in the way of military preparedness. The training areas of France were perhaps better

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adapted to this end than those of the United States, which has the trying climate of a country somewhat southern in its geographical relation to Europe. Hot, moist and low-lying areas have never been notorious for improving the physical standard of human beings. Given a well-selected camp site, with graduated training in the early stages, your recruit will soon be in position to stand anything.

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ASSOCIATION NOTES

The following named officers have been elected to active membership in the Association of Military Surgeons of the United States since the publication of our last list:

U. S. Public Health Service

Asst. Surg. Walter K. Foley

Medical Corps, U. S. N. R. F.

Lieut. Rex H. White

Medical Corps, U. S. Army

Major

Frank Brooke Foster

Captains

Foster A. Beck
Mortin V. Godbey
Arthur G. Heath
Isidore I. Hirschman
James Gilbert Howard
Howard W. Nowell

Captains—Continued

Elmer Harrison Ormsby
Charles A. Riley
Charles H. deT. Shivers

First Lieutenants

John Williams Leo Brennan
Sewell B. Coulson
Thomas Aubrey Dickson
John Edd Furry
Jose A. Hernandez
William Roy Keller
Thomas Junior Nunnery
Albert L. Stubbs
Charles F. Swanson
J. Wiley Thimlar

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COMMENT AND CRITICISM

The following extract from weekly Bulletin No. 57 of the A. E. F. is reproduced here as a matter of interest in regard to a question which has been much under discussion. Inasmuch as pneumonia was the same scourge with our forces during the present war that typhoid was during our campaign in 1898, anything which tends to a knowledge which shall diminish either the incidence or fatality of this disease ought to command our respectful attention. It is believed that both the figures and the ratios in the table given would be of interest as well as the explanatory text.

J. R. C.

ENCOURAGING RESULTS

USE OF PNEUMOCOCCUS VACCINE IN BASE SECTION 2

(Report from office of Base Surgeon)

Results of Vaccination against Pneumonia in Base Section No. 2, A. E. F., 26 April, 1919

Place	Number of men		No. of pneumonia cases		Deaths from pneumonia	
	Vaccinated	Not vaccinated	Among the vaccinated	Among those not vaccinated	Among the vaccinated	Among those not vaccinated
Camp de Souge	4,447	5,383	3	2	1	.....
Embarkation Camp:						
Permanent	2,130	427	7	8	.....	.....
Casuals	27,054	25,478	10	26	1	7
St. Sulpice	8,331	2,670	16	40	3	4
Pontenx	2,675	1,075	2	2	.....	.....
Angouleme	69	251	.....	1	.....	.....
Camp Hospital No. 79:						
Casuals	4	10,379	.....	4	.....	.....
Permanent	62	685	.....	.....	.....	.....
Bassens No. 4	782	1,995	.....	.....	.....	.....
Dax	156	776	.....	.....	.....	.....
Camp Hospital No. 104	46	77	.....	.....	.....	.....
Camp Hospital No. 19	143	267	.....	.....	.....	.....
Totals	45,849	49,463	88	83	5	11
Rates per 100,000 strength	.....	.....	83.5	168	10.8	22.2

In the preparation of the above table no cases of pneumonia are counted until one week after the organization has been vaccinated. The number of men in the organization one week after vaccination of some of their number is indicated; for instance, at Camp de Souge 4,447 men who had been vaccinated, and at the same time 5,383 who had not been vaccinated. Since one week after vaccination 3 cases of pneumonia have appeared among the vaccinated and 2 among the unvaccinated.

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This same procedure has been adopted for the other camps. No camps have been included in which some vaccination did not occur. From this table it will at once appear that the vaccination had nothing to do with the incidence of pneumonia except in possibly the Embarkation camp and at St. Sulpice. In regard to the Embarkation Camp, it should be stated that many of the casuals had returned to the United States so that complete records are not available. At St. Sulpice this fact should be noted: the composition of this camp is of American soldiers and about 2,500 German prisoners. The American troops were vaccinated during the latter part of February but the German prisoners were not vaccinated. About the middle of March an outbreak of influenza and pneumonia appeared among the American troops and the German prisoners, with the result that there were about 16 cases of pneumonia among the American troops and about 40 cases of pneumonia among the German prisoners, with deaths as indicated. Since that time the German prisoners have been vaccinated. In this connection it should be pointed out that the American troops were protected not only by vaccination but by a certain degree of immunity occasioned by a previous outbreak of influenza and pneumonia.

It would appear from the three months' experience here reported that probably slight protection against pneumonia was offered by vaccination. The table as a whole would indicate that a person who was vaccinated was about half as liable to infection with pneumonia as one who was not, and that a patient who developed pneumonia was about half as likely to die if vaccinated as one who was not vaccinated. The figures in this table would seem to encourage the proposition to try out on an extensive scale prophylactic vaccination against pneumonia next December just before the pneumonia season begins.

Clinical reports from the chiefs of the medical services of the hospitals in Base Section 2 indicate that among the pneumococcus pneumonia patients who had vaccinated against pneumococcus infection, the course of the disease is of a milder character and of a shorter duration.

We quote the following statistics from Weekly Bulletin No. 59 of the Chief Surgeon, S. O. S., of the American Expeditionary Forces, as being of interest to our readers:

INTERESTING TOTALS

1. From June 15, 1917, to February 28, 1919, inclusive, there were 708,335 cases of disease, causing a loss of 8,277,657 days of service.

There were 225,955 cases of traumatism (including all battle casualties), causing a loss of 2,705,588 days of service, or a combined total of 934,290 cases, and a loss of 10,983,245 days of service, or 30,091 years.

2. Of the cases of disease: 90.2 per cent returned to duty, 6.0 per cent were invalided home, 3.3 per cent died in hospital, and 0.5 per cent deserted. Of the cases of traumatism: 73.8 per cent returned to duty, 21.1 per cent were invalided home, 5.7 per cent died in hospital, and 0.4 per cent deserted.

3. The average time in hospital for both classes of cases was 11.7 days per case. Of those reported as deserted many are believed to have left the hospitals to return to the front.

4. Mumps has caused the greatest loss of days from non-effectiveness due to disease. There have been 83,202 cases of mumps, with a loss of 1,000,424 days of service in the A. E. F., from July 1, 1917, to March 31, 1919. There were only 43 deaths from mumps during that period.

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5. The greatest number of deaths from disease of all kinds was due to pneumonia. There were 28,292 cases of pneumonia, causing a loss of 622,424 days of service in the A. E. F., from July 1, 1917, to March 31, 1919 inclusive, with 12,361 deaths.

6. Of all deaths in the A. E. F., 32 per cent or 2 in 7 died from disease.

Of total deaths from disease for the period June 15, 1918, to March 31, 1919, inclusive, numbering 17,691, there were—

11,786 deaths from pneumonia, or	66.6	per cent
715 deaths from meningitis, or	4.0	per cent
515 deaths from influenza, or	2.9	per cent
351 deaths from tuberculosis, or	1.4	per cent
143 deaths from typhoid and paratyphoid, or	0.8	per cent
64 deaths from measles, or	0.3	per cent
40 deaths from diphtheria, or	0.2	per cent
29 deaths from dysentery, or	0.16	per cent
27 deaths from scarlet fever, or	0.15	per cent
4,021 deaths from all other diseases, or	22.7	per cent

Of all wounded 1 in 14 died.

7. The average rate of venereal diseases was under 40 per 1000 per year.

8. Total mental diseases including mental deficiency was from June 15, 1917, to April 27, 1919—12,266 cases, of which 8,076 were returned to duty.

9. Total number of cases evacuated from the front, 214,487.

Total number of patients evacuated to the U. S.—to April 29, 1919—119,974.

10. Maximum number of beds with date was 299,835 beds on Nov. 21, 1918. (Including Convalescent Camps, but not Evacuation Hospitals or other Army Units). S. O. S. only.

Maximum number of patients with date was 193,026 on November 12, 1918. (Including Convalescent Camps). S. O. S. only.

11. The maximum number of hospitals centers was 23 on December 5, 1918.

12. The maximum number of Base Hospitals operating at one time was 122 on January 2, 1919.

13. The maximum number of Camp Hospitals operating at one time was 64 on February 6, 1919.

14. The maximum number of Convalescent Camps was 14.

15. Total number of Camp Hospitals operated during entire period was 97.

16. Losses in A. E. F. June 15, 1917 to April 15, 1919, inclusive:

Killed in action, Army and Marines	33,887
Died of wounds, Army and Marines	14,190
Wounded, Army and Marines	201,230
Died of disease, Army and Marines	22,986
Died of other causes, Army and Marines	4,281

17. Among the medical supplies received by the A. E. F. were: Ether, 913,480 pounds; sheets, 3,790,268; foot powder (talcum), 3,024,029 pounds, equal to 1,512 tons; gauze, 107,055,986 yards, equal to 61,388 miles (unrolled it would extend nearly two and one-half times round the world.)

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CURRENT LITERATURE

Journal of the Michigan State Medical Society. Vol. xviii, No. 5. Grand Rapids, May, 1919. Victory Number.

This number is devoted, as its name indicates, largely to consideration of those who were in the service of the country during the present war. The issue of the magazine is almost entirely given up to reproduction of photographs of officers of the State of Michigan and should prove a very gratifying number, particularly to the representatives of that State. The only error which we note in this connection is the transposition of the initials of the name of Major General Ireland. The cover of the magazine is attractive and, all in all, it is a good piece of work.

J. R. C.

Modern Medicine. Vol. i, No. 1, May, 1919. Published monthly by the Modern Hospital Publishing Company, Chicago, Ill.

We are in receipt of the first number of the magazine listed above. It is in form of make-up of the same excellent type as the *Modern Hospital*, of which it is in reality an offshoot. The editorial staff assures the seriousness of the publication, and one of the objects of the periodical is that stated in the letter accompanying the first copy which states that "The editorial appeal of *Modern Medicine* will be directed especially to that part of the profession interested in industrial hygiene, public health and current problems in social medicine."

The make-up is attractive and the illustrations ample and to the point. We notice one of the decorations on the front cover is a modification of the caduceus, the winged staff of Mercury. This being the case we suppose that eventually the editors will have to account to the pages of the *Journal of the American Medical Association* for its usage in view of the strictures based on the adoption of this symbol in connection with matters medical.

J. R. C.

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BOOK REVIEWS

DISEASES OF THE HEART AND BLOOD VESSELS, by Thomas E. Satterthwaite, A.B., M.D., LL.D., Sc.D., Consulting Physician to the Post-Graduate, Orthopedic, Manhattan State and Babies' Hospitals, etc. New York City: Lemcke and Buechner.

Under the above title Dr. Satterthwaite contributes what is, in fact, a revised edition of two earlier works on cardio-vascular diseases, based on the results of observations of a trained clinician. Some of the chapters in the older volumes have, with advantage, made way for the discussion of subjects of more timely interest. Inclusive chapters on general and special methods of diagnosis logically introduce the subject, and are followed by sections on the various cardiac and vascular diseases and disorders. The relation between the circulatory system and the ductless glands has been given considerable attention, with a special chapter on Graves' disease. Such topics as "Cardiac Neoplasms" and "Cardiac Parasites" are concisely discussed, while the important matter of therapy has been treated more fully. Special forms of treatment, *e.g.*, hygienic and dietetic, are rationally evaluated, and nowhere does the physician of large experience lose sight of the patient's individual needs. A chapter on "Surgery of the Heart," by Dr. W. Wayne Babcock, may be especially commended as one of the best contributions to this subject to date.

The author fulfils the promise of presenting his subject with clarity and conciseness, in a style which cannot fail to appeal to the busy physician.

REVIEW OF ELEMENTARY BACTERIOLOGY AND PROTOZOOLOGY FOR THE USE OF NURSES, by Herbert Fox, M.D., Third Edition, Illustrated. Philadelphia: Lea & Febiger, 1919. Price, $1.75.

In writing a book upon bacteriology and protozoology for nurses, it is evident that it has to be made as brief as possible, consistent with the information that it is desirable that nurses should have regarding these subjects.

A careful examination of this book has shown that the portion devoted to bacteriology fulfils his function and that the descriptions are accurate and easily understood.

Unfortunately, the same cannot be said for the section devoted to protozoology, where many errors are noted, and while it is not supposed that these organisms would be treated fully in a work of this character, there is no reason why what is said regarding them should not be accurate. For instance, in discussing *Endamoeba histolytica*, the statement is made that these organisms are "cultivated artificially with great difficulty," and further, that "only monkeys and dogs" are susceptible to the ameba causing disease in man. The latter statement is inaccurate, as *Endamoeba histolytica* produces disease in cats, and these animals have been more frequently used in experimental work than either monkeys or dogs.

Regarding the statement as to the cultivation of these organisms, there is as yet no positive proof that *Endamoeba histolytica* has been cultivated upon artificial culture medium.

Again, in discussing malaria, the statement is made that monkeys may be artificially infected. So far as the writer is aware, malaria has never been produced experimentally in any animal but man. It is unfortunate that in a work of this character such statements should be made.

The book is well printed and illustrated.

CHAS. F. CRAIG.

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HISTORY OF THE WORLD WAR, by Frank H. Simonds. Published for the Review of Reviews Company by Doubleday, Page and Company, New York City. Volumes 1, 2, and 3. Other volumes to follow. Price, $3.50 per volume.

The accepted dictum that histories should not be written until the lapse of considerable time had mellowed the views of the writers and given a better perspective has been consigned to the limbo of discarded theories and rests there with many other traditions which the World War has proven fallacious. With a conflict as far reaching as the one which is in its closing stage it would be folly to allow the many contributing causes, the shifting events and the political lights to become obscure and grow dim under the dust of time before recording them. Even under the vivid light of the present the accurate setting forth of the events of this mighty struggle, the orderly array of cause and consequence, is a task which calls for much skill and an analytical faculty which is not vouschafed to all those who write.

Early in the war, Mr. Simonds compelled attention by his concise analysis of the shifting situation in Europe, and it is not too much to say that his reviews of current events in the theater of war were recognized universally as being the most authoritative of those appearing in the press. What he wrote was not "res gestae," the best interpretation at second hand of matters of fact, but the opinions of a clear-thinking, level-headed man who went, wherever possible, to the source and scene of what he wrote about and told what he saw and knew. This being the case, it is inevitable that his deductions must carry an additional weight over any which depend largely on documentary evidence for their facts. He *saw* many of the things he writes of; he talked with many of the leaders who shaped the events which he describes. This was a material advantage, and no less so, but falling in a category apart, is the fact that he has the trend of mind which enables him to see clearly without distortion, to draw accurate conclusions and to write them in forceful and convincing language.

What he undertakes to do in his history is clearly set forth in his Preface, and the fact that he recognizes the magnitude of the task very frankly is to us rather more convincing as to his ability to cope with it than if he had approached the subject entirely with the air of one who would speak "ex cathedra."

The three volumes thus far published give evidence of the thoroughness with which the completed work will cover the subject. The Introduction by Albert Shaw in the first volume gives a full and scholarly review of the purpose of the work, and points out the special qualifications of Mr. Simonds for the task. The volume itself begins in Chapter I with a review of affairs in Europe between 1871 and 1904, dealing largely with political conditions and their bearing on the final rupture. The last chapter, XII, deals with conditions on the west front from November, 1914, to May, 1915, and between the two we note as chapter headings, "The German Attack," which sets out their strategic conceptions; "Belgian Defense and French Offense"; "The Battle of the Marne"; "The Battle of Lemberg." These comprise Part I of the volume. In Part II we have a series of interpretations of special phases and descriptions of methods and machinery which had a high contributory value in the issues at stake. These are written by experts who were particularly qualified to treat the subjects with which they deal and, as evidence of this, we may quote: "The Russian Conquest of Galicia, by Stanley Washburn;" "Flying Machines and the War, and interview with Orville Wright; by Fred C. Kelly;" and the "Language of the Big Guns, by Hudson Maxim."

Volume II begins with "The New Phase," starting with the recognition by the Germans of the failure of their original plan and the awakening of the Allies to the danger of their position. Chapters III, IV and V are taken up with a discussion of the naval aspect of the struggle. The following chapters, up to Chapter XIV, take up Italy's entrance and follow progress both in the east and the west, with one de-

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voted to the Russian collapse and the fall of Warsaw. Part II of this volume is also devoted to discussions by experts on topics of importance, and we note articles by Lord Northcliffe, Sir John Jellicoe, Joseph Chailley and H. J. Elliot.

In Volume III we have a very complete account of the struggle which centered about Verdun and the Somme, and Mr. Simonds is peculiarly qualified to speak on this phase inasmuch as he was present in person and writes of that which he himself knows. Chapter V treats of the Irish Rebellion, the surrender of Kut, the Battle of Jutland and the fall of the Asquith Ministry. The battle of the Somme is dealt with at length, and in Chapter XI the Italian situation is reviewed. Chapter XII gives an account of the last Russian offensive, while subsequent chapters are taken up with the Rumanian *debacle*, the affairs at Salonica and Monastir, and a general review of the campaign of 1916, together with an account of the launching of the first German peace offensive.

Part II contains Mr. Simonds' personal narrative of his trip to Verdun, articles by Viscount Bryce, Henry Morgenthau, Philip Gibbs, Major S. J. M. Auld and others.

The volumes are profusely illustrated, many of the illustrations being in color and a number of them photographic reproductions. The maps are complete and supplement the text thoroughly. The whole work is attractive in appearance and, with its completion by the publication of the remaining volumes, will place at the disposition of those who are thoughtfully interested in the inception, progress and termination of this titanic struggle a most complete and scholarly analysis of the whole great tragedy.

JAMES ROBB CHURCH.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interest of our readers and as space permits.

MEDICAL WAR MANUAL NO. 8.—Military Surgery of the Ear, Nose and Throat, by Hanau W. Loeb, Major, M. R. C., U. S. A. Philadelphia and New York: Lea & Febiger, 1918. Price, $1.25.

THE BLIND—Their Condition and the Work Being Done for Them in the United States, by Harry Best, Ph.D. New York: The MacMillan Company, 1919.

THE SURGICAL CLINICS OF CHICAGO, Vol. iii, Number 2 (April, 1919) Philadelphia and London: W. B. Saunders Company. Published bi-monthly. Price per year: Paper, $10.00; cloth, $14.

LA PROTHESE FONCTIONNELLE DES BLESSES DE GUERRE, by Dr. Ducroquet. Masson & Co., 120 Boulevard Saint-Germain, Paris, France. 1919.

LECONS DE CHIRURGIE DE GUERRE. Masson & Co., 120 Boulevard Saint-Germain, Paris, France. 1918.

HISTORY OF THE WORLD WAR, by Francis A. March, Ph.D., with an introduction by Gen. Peyton C. March, Chief of Staff of the U. S. Army. Philadelphia, Chicago and Toronto: The John C. Winston Company, 1919. Price, $3. net.

THE CONTROL OF HOOKWORM DISEASE BY THE INTENSIVE METHOD, by H. H. Howard, M.D. Publication No. 8, The Rockefeller Foundation, International Health Board, New York City, 1919.

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INSTRUMENTS AND APPLIANCES

CAMP FUNSTON GARBAGE STAND AND FLY TRAP

(With one illustration)

The following letter, together with the specifications which follow it, are self-explanatory. They need no comment except the possible suggestion that fly time is now upon us and it may be very seasonable material with the object of obviating this ever-present pest and menace.

J. R. C.

HEADQUARTERS CAMP FUNSTON
Office of Camp Surgeon
Camp Funston, Kansas.

April 9, 1919.

EDITOR, "MILITARY SURGEON,"
Army Medical Museum,
Washington, D. C.

SIR:

I am enclosing a cut and specifications of a combined Garbage Stand and Fly Trap, devised and adopted at Camp Funston last year, which proved to be most effective.

Every organization was provided with these stands, which were made of scrap lumber at practically no expense. They added materially to the appearance of the camp and caught a surprisingly large number of flies.

This is offered as a suggestion, as being an effective method of handling garbage and, should you wish to publish it, you are welcome to do so.

I am, very respectfully,

WILLIAM H. TUKEY,
Major, Medical Corps, U. S. A.,
Camp Sanitary, Inspector.

CAMP FUNSTON GARBAGE STAND

Holds six cans in second story. First story used for sacks of paper or galvanised iron cans of ashes, sweepings, bottles, etc. Base of second story is placed four feet from ground, so as to allow cans to be pulled by one man directly onto the platforms of the garbage trucks, which are 8 x 12 feet, and 3¾ feet from the ground and hold thirty cans.

Various devices can be added to the stand to suit special situations, such as placing a foot board in front similar to rear, except that it should be dropped a few inches, so as to allow placing of a skid when one is deemed advisable. If one or two of the end battens are extended upward a few inches, they will form rests or stops for the outside doors. The fly trap will brace the center door.

The cans are filled through the top doors, and are removed through the front doors.

FLY TRAP

The unique feature of this garbage stand is found in the fly trap. There is a large opening in the center top door over which is placed the trap. As the stand, when closed, is dark—the only light coming through the trap—the whole stand be-

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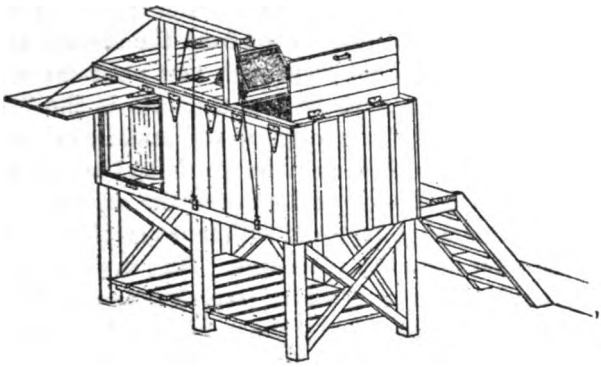
comes a fly trap with the cans as bait. Any fly that gets inside is almost sure to meet his finish in the trap.

The garbage stands have been ordered placed at every kitchen in such locations that garbage trucks can load without the men getting off of the trucks or doing any lifting.



The two stories are built separate, though this is not necessary.

Materials required for the stands, without the base or first story, is enumerated below; but can be varied to suit the builder's convenience. In Camp Funston they are built from scrap lumber.

Bill of Material

Base Posts
6 posts 4 x 4 in. x 5 ft. 6 in.
Flooring—
4 pieces 2 x 10 in. x 6 ft. 4 in.
1 piece 2 x 8 in. x 6 ft. 4 in.
Floor Beams—
2 pieces 2 x 6 in. x 6 ft. 1 in.
2 pieces 2 x 6 in. x 5 ft.
1 piece 2 x 6 in. x 3 ft. 9 in.
Framing Uprights—
4 pieces 2 x 4 in. x 2 ft. 9 in.
2 pieces 2 x 4 in. x 5 ft.
Plates—
2 pieces 2 x 4 in. x 6 ft. 4 in.
2 pieces 2 x 4 in. x 4 ft.
1 piece 2 x 4 in. x 3 ft. 6 in.
2 pieces 2 x 4 in. x 3 ft. 7 in.
Siding For Ends—
12 pieces 1 x 8 in. x 3 ft.
Siding for Back—
7 pieces 1 x 10 in. x 3 ft.
1 piece 1 x 8 in. x 3 ft.
Finishing Lumber—
2 pieces 1 x 3 in. x 6 ft. 4 in.
2 pieces 1 x 3 in. x 3 ft. 9 in.
18 pieces 1 x 3 in. x 1 ft. 8 in.
18 pieces 1 x 3 in. x 1 ft. 11 in.
2 pieces 1 x 2 in. x 3 ft. 6 in.
3 pieces 1 x 10 in. x 3 ft. 7 in.
3 pieces 1 x 12 in. x 3 ft. 7 in.
3 pieces 1 x 10 in. x 3 ft.
3 pieces 1 x 12 in. x 3 ft.
70 feet 1 x 1 1-2 in.
Hardware—
3 pair butt hinges, 2½ x 2½ in.
3 pair Tee hinges, 3 x 6 in.
72 1in. No. 10 F. H. screws.
5 lbs. 16D nails.
5 lbs. 5D nails.
3 pulleys, 1½ in.
30 ft. sash cord.

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AN IMPROVEMENT OF THE AEROPLANE SPLINT

By Captain FRANK W. ROMAINE
Medical Corps, United States Army

(With three illustrations)

During the European war many varieties of splints have come into vogue. Some of them were resurrected from the discard and put into use, while others combined old ideas with new positions and arrangements. Among the various mechanical supports is the "Aeroplane" splint used for fractures of the surgical and anatomical necks of the humerus, gunshot wounds of the shoulder involving the joint and wounds of the outer end of the clavicle and spine of the scapula. This splint has been used to great advantage and with much comfort to the patient, both before and after operative procedure. But, as devised, it does not meet all the requirements of the long convalescence of these types of cases. A later style has practically the same objections, as it does not permit of lowering the arm with support in the axilla, the point where support is most needed.

Fig. 1 (the original splint) shows the rigid support—the idea in the first weeks of convalescence to maintain the arm and forearm at right angles to the body.

Fig. 2 shows the splint devised to permit the lowering of the arm and forearm. In this type the support of the arm and forearm is lowered *en masse* by loosening the thumb screw A (Fig. 2) and allowing the upright rod to slide down to the desired distance, when the screw is tightened. This permits of a relaxation at a point where support is most desired and a general sagging of the arm, causing a greater strain at the point most needing support. This splint has been found to be undesirable, uncomfortable and painful to the patient.

In the improved splint, Fig. 3, as devised and used on war wounds of the shoulder involving the head of the humerus, clavicle and scapula, a happier result is obtained. A greater degree of comfort is afforded the patient, a rest is established for the arm and forearm and support is maintained in the axilla. The lowering and raising of arm and forearm are executed without disturbing the dressings or requiring the removal of the splint.

In Fig. 3, at the angle formed by the horizontal and perpendicular rods, a hinge (A) is made. A band of steel ¾ inch wide and 2¼ inches long is riveted to the horizontal rod 1¼ inches from A. At point B is hinged a band similar to the first, 2¾ inches long, connected at an angle of 45 degrees with a sliding double sleeve (D) which is fitted with a thumb screw (E) permitting the lowering and raising of the sleeve and the consequent movement of the horizontal arm support. The upright between the points A and G is roughened, permitting the thumb screw (E) to bite and hold firmly.

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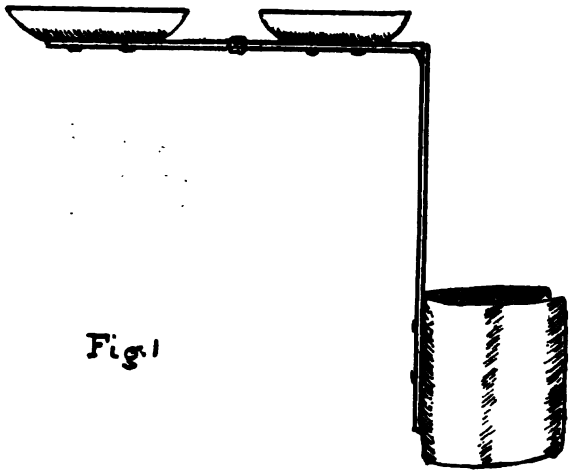

Fig. 1

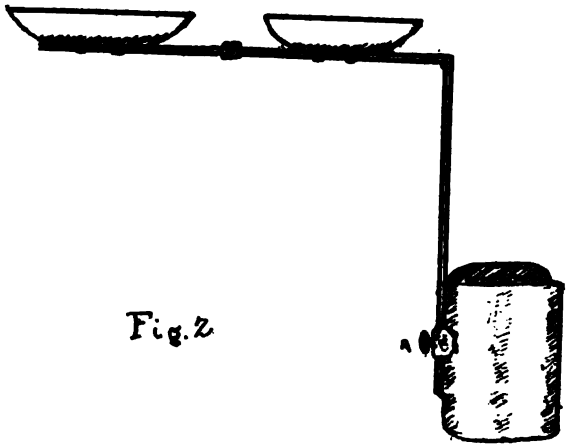

Fig. 2

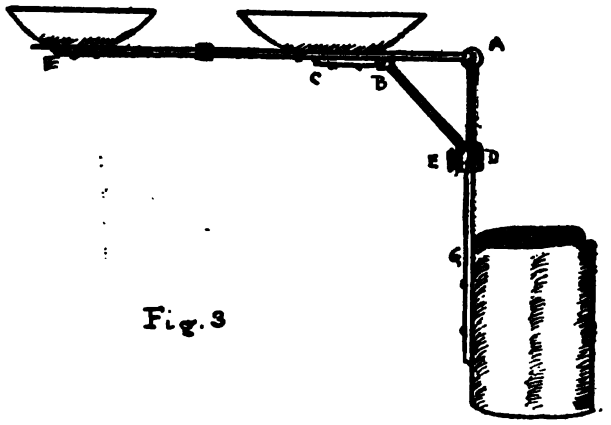

Fig. 3

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Obituary

MISS JANE A. DELANO

Miss Jane A. Delano, who died on April 15 at Base Hospital No. 8, Sauvigny, France, was one of the foremost figures of the nursing world. It was under her direction that more than 30,000 nurses were recruited through the American Red Cross for service with the Army and Navy after the United States entered the great conflict. She was born in Watkins, N. Y., in 1862. Her father was killed in the Civil War and she was reared by her grandfather, a Baptist clergyman.

The call to relieve suffering humanity came to her while still a young girl, and after her preliminary education she began fitting herself for the career in which she was destined to attain such great prominence.

Miss Delano graduated from Bellevue Hospital, New York, in 1886, and two years later rendered her first patriotic service to her country by volunteering to nurse yellow fever victims in Jacksonville, Fla. Up to the time Miss Delano and a few other courageous trained nurses went to Jacksonville from New York the fever patients had been cared for by some negro nurses, who, while willing and devoted, lacked the scientific skill necessary to combat successfully the dread malady.

Her work in Jacksonville finished, Miss Delano was called to Bisbee, Ariz., in 1889, to establish a hospital for one of the big copper companies. Two years later she was made superintendent of the nurses' training school of the University of Pennsylvania, a position she held for five years.

When the American Red Cross, following the reorganization in 1906, entered into an agreement with the American Nurses' Association for the purpose of developing a nursing reserve for the Army Nurses Corps, Miss Delano was appointed chairman of the committee in charge of the work.

Miss Delano served three times as president of the American Nurses' Association and was for several years head of the directorate of the *American Journal of Nursing*.

She was a woman of striking personality and appearance. Regal in carriage, a mass of snow-white hair crowning a strong, but kindly face, she was a commanding figure in any gathering. A gentle manner and sympathy that was boundless won for her a great circle of friends.

Miss Delano served the American Red Cross from first to last without compensation—a full-time volunteer. She was the last of her family, her passport application, filed a few months ago, giving the name of a prominent nurse as her "nearest relative."

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THE
MILITARY SURGEON
VOL. XLV AUGUST, 1919 Number 2

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

A REPORT ON THE INTENSIVE ANTI-TYPHOID CAMPAIGN IN SOUTHWESTERN GERMANY, INCLUDING AN ANALYSIS OF DATA ON SEVENTY-ONE TYPHOID CARRIERS UNDER OBSERVATION BY THE LABORATORY AT TRIER, GERMANY.

BY MAJOR PAUL A. SCHULE
Medical Corps, United States Army

General and Historical.—The mortality statistics for Germany show a marked decrease in the number of deaths due to typhoid fever from 1870 to 1894. In Berlin, for example, the typhoid death rate declined from 7.9 per 10,000 of population during 1870 to 0.5 per 10,000 in 1895 and 0.43 per 10,000 in 1900. This marked decrease throughout Germany was due to general improvement in sanitary conditions, including the installation of excellent water supply and distributing systems, the supervision of the milk supply, and the water-carriage disposal of wastes and sewage.

After all these improvements, there remained a typhoid morbidity and mortality rate that had to be explained on the basis of other means of dissemination of the virus. The experience during the cholera epidemic at Hamburg, 1892-3, proving the existence of very mild, ambulatory cases of cholera and the fact that convalescent and even recovered cases sometimes continued to excrete cholera vibrios in their stools, offered an explanation, by analogy, for the residue of typhoid incidence. Evidence accumulated to show that typhoid bacillus carriers played a considerable rôle in spreading the disease and in keeping it endemic.

In endeavoring to estimate the importance of carriers in typhoid epidemiology, Robert Koch saw the importance of improved methods of bacteriological diagnosis of typhoid bacilli in stools. Under his direction Conradi and V. Drigalski worked out their improved technique and culture medium.

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To combat typhoid fever and to eliminate it entirely from the list of human diseases, Koch advocated the following points of attack:

1. The earliest possible diagnosis af the suspected case.
2. The complete separation in hospitals of proved typhoid cases.
3. The release of convalescents only after several negative examinations of urine and stools at stated intervals.
4. The similar examination of all individuals in contact with the proved typhoid cases.
5. The thorough investigation in typhoid centers in typhoid *seasons* of all mild, atypical, possible typhoid cases.

It was decided to try out an intensive campaign against typhoid in a limited area. It has been said above that the typhoid death rate in Berlin was 0.43 per 10,000 inhabitants in 1900. The same year the rate for Prussia was 1.38 per 10,000, and in the administrative district of Trier it was 2.76 per 10,000. This district of Trier, with some neighboring territory, was therefore chosen. The whole district for the campaign is made up of adjacent parts of Prussia, Bavaria, Oldenburg, the whole of the Crown Lands of Lower Alsace and Lorraine, and a small part of Upper Alsace. The population in 1910 of the districts concerned and occupation by per cent in each is given in the following table:

District	Population 1910	Agriculture, forestry and fishing	Industry and commerce	State, military service, or none
		Per cent	*Per cent*	
Of Prussia	1,104,176	30.5	56.7	12.8
Bavaria	937,085	30.4	58.5	11.1
Oldenburg	50,496	30.7	61.3	8.0
Crownlands	1,453,885	32.3	50.4	17.3
	3,545,642	31.3	54.6	14.1

The area includes the cities of Strassburg, Saarbrücken, Ludwigshafen, Metz, Kaiserslaütern and Trier, in order of population. The area also includes great coal and iron mines and immense ironworks. In general, communication is easy and traffic lively because of the great railways and excellent highways. Certain districts, however, are hilly and forested and the density of the population correspondingly varies.

Legislation and Appropriations.—A campaign against typhoid was recognized as partially direct and partially indirect. The direct campaign aims at the discovery of the virus and rendering it innocuous. To accomplish such an end involves many infringements upon personal freedom. The indirect campaign against typhoid deals with the elimina-

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tion of all such conditions as favor the spread of the disease in general; it involves a consideration of water supplies, care of streets and public places and the improvement of homes and working conditions with the technical and financial features of the question. These latter measures are general health procedures and are not peculiar to a campaign against typhoid merely.

Legislation on measures to combat typhoid fever *directly*, involving, as it does, personal freedom, was left to the various states of the empire. The Imperial Health Office drew up a general outline of procedure which was approved by the Imperial Minister of Public Health. This proposed outline directed among other things:

1. Instructions to physicians on the contagious nature of typhoid, the reporting of cases, isolation, confirmation of diagnosis, forwarding of material for bacteriological investigation, and disinfection.

2. The reporting of individual cases and compilation of cases on forms.

3. Special instructions on disinfecting agents and methods of using them.

Of the four states concerned, however, only Prussia passed a law making the procedures compulsory, effective from August, 1905. In the other three states concerned, Bavaria, Oldenburg and Alsace-Lorraine, no special laws were passed to favor the campaign against typhoid in all its aspects. But laws already existed in these three states making typhoid fever a reportable disease.

In 1903 the imperial government appropriated 150,000 marks, a like sum in 1904, and for each year from 1905 to 1909, 200,000 marks. The annual appropriation was reduced to 175,000 marks in 1910 and to 150,000 marks in 1911. In addition, the three states of Prussia, Bavaria and Alsace-Lorraine contributed smaller amounts amounting to a total, from 1903 to 1909, of 1,200,000 marks, giving a grand total for the years 1903 to 1909 of 2,500,000.

Laboratories.—The first laboratory was established at Trier in 1902. By the end of 1904 there were in the area, specially engaged in this campaign, 11 laboratories, with 33 chiefs and assistants in addition to technicians. The Prussian and Bavarian Ministers of War aided largely in supplying the necessary trained doctors. These doctors engaged not only in laboratory work proper but also went out to investigate the epidemiology of new cases in an attempt to trace their origin, to direct appropriate measures to prevent further spread of the disease, and to keep in touch with the doctors and health officers in the various localities.

Laboratory Methods.—Bacteriological examinations included: (1)

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blood culture, (2) Widal reaction, (3) stool culture, (4) urine culture, (5) water examinations when indicated, and (6) postmortem examination.

1. *Blood culture.*—While it was recognized that the best method is to draw the blood from a vein in the arm, it is difficult to obtain the patient's consent. Usually, the blood is taken by puncture of the lobe of the ear and collected and sent in a glass capsule of not more than 1 c.c. capacity. Frequently even this small amount is not obtained. Wooden shipping cases and labels are provided. The clotted blood is transferred to broth or bile and incubated. Culture from rose spots is rarely done.

2. *Widal reaction.*—Serum from blood sent in is used for the Widal reaction. The macroscopic agglutination is done, two hours at 37°, in dilutions of 1–20, 1–50 and 1–100.

3. *Stool culture.*—Samples of stools to be examined are sent to the laboratory in small glass vials with spoon fixed in the cork. A piece of feces the size of a pea is rubbed up in salt solution, allowed to sediment, and a drop from the surface is spread on Conradi's malachite green agar. After incubation over night, the growth is covered with salt solution and, after ten minutes, a drop is taken up with a glass rod and spread over Endo plates. From this plate suspicious colonies are fished and agglutinated by the drop method on glass slides against typhoid, paratyphoid A and paratyphoid B immune sera. Culture tests are done as indicated, using plain broth, glucose agar stab, and litmus whey.

4. *Urine culture* is similar to stool culture except that a drop of urine is spread on the malachite green plate.

5. *Examination of water* for typhoid bacilli is rarely done. The method used is to add sterile peptone solution, incubate and without shaking the flask, take a drop from the surface and spread it over the malachite green agar plate. Further procedure is the same as in stool culture.

6. *Postmortem examination*, bacteriologically, consists in culturing the spleen, gall bladder, lymph nodes, Peyer's patches, and also intestinal contents, especially of the duodenum.

GENERAL SANITATION

Water, Sewage and Food Stuffs

Water.—The administrative district of Trier is selected to show the conditions existing in 1902 and the subsequent improvements. There were in 1902 in this district only 100 central water supplies. In the more rural areas water was used from open, unprotected wells most frequently; pump wells were relatively rare. It was difficult to combat

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the indifference of the people, and efforts at instruction met with unbelief. "My parents and grandparents drank this water and lived to be old people." In January, 1904, there appeared "General directions on construction, management and maintenance of water supply plants serving the public." Yearly inspections by the local health officer and building inspector were ordered. Provision was made for bacteriological and chemical examination, and containers for taking water samples were supplied at a small cost. Financial aid in substantial amount was given by the state. Villages were grouped to be served by a common central supply. For example, 43 communities were grouped for one central water supply installed at a cost of 1,500,000 marks. Attention was given also to improvement of private wells and water sources. To summarize, from 1902 to 1908, 8,000,000 marks were expended on the installation of 233 new central water supplies and the improvement of 4,818 individual water sources.

Disposal of wastes.—The district of Trier is again used as an illustration. From 1902 to 1908, 13,500,000 marks were expended in constructing systems for proper disposal of waste and garbage, sewers, drains, etc.

Milk.—Very great attention has been paid to the handling of milk. Control of dairies previous to 1902 had been incompletely planned and carried out. The president of the district issued in that year directions for the inspection of dairies in all particulars pertaining to cleanliness of plant and personnel and handling of milk. Meats, mineral waters, lemonade, beers, and baked goods are controlled by special police regulations.

Vaccination against typhoid. In the civil population this has not been employed to any considerable extent. The experience of soldiers is tending to popularize it somewhat. Opportunity to use vaccination to clear up the carrier state in individuals was offered on only two occasions with negative results. In general, it may be said that vaccination was not used in the antityphoid campaign.

Typhoid bacillus carriers.—Records of seventy-one carriers under observation by the laboratory at Trier are available for analysis.

How determined.—Carriers were discovered in one of two ways: (1) persistence of typhoid bacilli in stools or urine of cases convalescent from typhoid, (2) by investigation of contacts to determine possible source of virus in a new case.

Sex.—Of 71 carriers, 17, or 24 per cent, were male and 54, or 76 per cent, female.

Age.—Considered by 5-year periods, the distribution of the 71 carriers was as follows:

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11–15 years	2	36–40 years	9	56–60 years	8
16–20 years	3	41–45 years	5	61–65 years	7
21–25 years	2	46–50 years	17	66–70 years	1
26–30 years	2	51–55 years	7	71–75 years	4
31–35 years	4				

Occupation of the 71 *carriers is:* Housewife, 31; no occupation, 11; farmer, 5; vine dresser, 4; miner, 3; day laborer, 2; railroad laborer, 2; 9 other occupations, each 1-9; insane, 4; total, 71.

History of previous typhoid:

No history of typhoid	3
Doubtful history of typhoid	16
Typhoid less than 6 months before	12
Typhoid between 6 and 12 months before	9
Typhoid between 1 and 2 years before	6
Typhoid between 2 and 5 years before	6
Typhoid between 5 and 10 years before	7
Typhoid more than 10 years before	12
Total	71

Duration of carrier state.—In the following table, carriers have been grouped according to length of time that bacilli have been proven to be present in their excreta. The records are unfinished, of course, the latest observation having been made in 1918.

Carrier less than 3 months	8
Carrier more than 3 months, less than 6 months	6
Carrier more than 6 months, less than 1 year	11
Carrier more than 1 year, less than 2 years	10
Carrier more than 2 years, less than 5 years	10
Carrier more than 5 years, less than 10 years	23
Carrier more than 10 years	3
Total	71

Gall bladder trouble in 71 *cases:* Colic, 2; gallstones, 1; 3 out of 71. It will be noted that the clinical evidence of gall-bladder trouble has been of very little assistance in suspecting the carrier.

Other disease or infirmities: Colitis, 1; rheumatism, 1; nephritis, 1; insane, 5; 8 out of 71. (NOTE.—Five insane cases come from investigation of outbreak in the local asylum.)

Results of examinations on 71 carriers: *Total stools* examined, 1,946; positive, 628 (32.2 per cent); negative, 1,318 (67.8 per cent). Stool examination was positive in 70 out of 71 carriers.

Total urine examined, 1,942; positive, 60 (3.1 per cent); negative, 1,882 (96.9 per cent). Urine examination was positive in 23 out of 71 carriers.

Sex has no influence on positive findings in urine. Thus, of 17 male

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carriers 6 gave positive urines or 35.3 per cent, 11 gave negative urines or 64.7 per cent; while of 54 female carriers 17 gave positive urines or 31.5 per cent, 37 gave negative urines or 68.5 per cent.

As to the value of the urine examination it should be noted that of 1,942 examinations the urine was positive only 60 times or 3.1 per cent; of these 60 positives, only 40 times was the simultaneous examination of the stool negative. These 40 examinations just mentioned were distributed among only 8 cases, one case alone giving 28 positive urines.

Consecutive negative examinations.—Repeated examinations have been done. Many carriers have been under observation for years as shown above. It is interesting to note that out of 71 carriers:

43 (60.6 per cent) gave 3
35 (49.3 per cent) gave 4
32 (45.6 per cent) gave 5
25 (35.2 per cent) gave 6
21 (29.6 per cent) gave 7
16 (22.5 per cent) gave 8
14 (19.7 per cent) gave 9
13 (18.3 per cent) gave 10
11 (15.5 per cent) gave 11
9 (12.7 per cent) gave 12
7 (9.9 per cent) gave 13
5 (7.0 per cent) gave 14
3 (4.2 per cent) gave 15
2 (2.8 per cent) gave 23
1 (1.4 per cent) gave 30

negative examinations of stools and urine and become positive again. One is tempted to conclude that "once a carrier, always a carrier."

Widal test information, though incomplete, shows that Widal test is of no value in determining carriers, *i. e.*, many carriers give a negative Widal test.

Secondary cases.—According to laboratory records under consideration, the 71 carriers have had the following relations to secondary cases: 30 of 71 gave no secondary cases before carrier state was determined; 42 of 71 gave no secondary cases after carrier state was determined; 21 of 71 gave no secondary cases either before or after the carrier state was determined; 41 of 71, before carrier state was determined, gave 76 direct secondary cases, 58 indirect secondary cases, a total of 134 or 3.2 cases per carrier; 29 of 71, after carrier state was determined, gave 55 direct secondary cases, 41 indirect secondary cases, a total of 96 or 3.3 cases per carrier.

Thus, 71 carriers have been interpreted as causing 96 plus 134, or 230 cases. If we compare the rates of secondary cases per carrier *before* and *after* the determination of the carrier state, we may conclude that the determination of the dangerous carrier state has had no good effect. It is impossible, of course, to say how many new cases of typhoid the carrier was responsible for before he was proven to be a carrier. It is probably much greater than absolutely known. But, *after* his carrier state was determined and his location made a matter of record, the

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number of secondary cases to be attributed to him, while not complete, perhaps, are much more nearly accurate.

Control of carriers.—This problem has not been satisfactorily met. They are forbidden to engage in any occupation which necessitates or makes likely the handling of any food stuffs for public use. The rest of the control of carriers may be termed educational. At the present time a small pamphlet is furnished the typhoid carrier which (1) defines a carrier, (2) explains the relation of the carrier to typhoid fever, (3) states that there is no way at present of ridding carriers of the bacilli, (4) informs the carrier of the great care that must be taken to protect his associates, (5) gives specific directions about disinfection of privy vault contents by means of slaked lime, cleanliness of privy, use of toilet paper, washing of hands in soap and water and spirits and the care of soiled clothes, to be boiled before given to anyone else to be washed, and finally (6) emphasizes the infectious and contagious character of typhoid. Accompanying this pamphlet is a card, briefly stating this conduct of the carrier at and following defecation. The use of spirits has of course been made impossible under war conditions in Germany. The folowing are translations of the circulars used in the education of carriers:

[*Translation*]

INSTRUCTIONS FOR TYPHOID BACILLUS CARRIERS

ISSUED BY THE ROYAL BACTERIOLOGICAL EXPERIMENTAL INSTITUTE OF TRIER, LINDENSTRASSE 20

Typhoid bacillus carriers are persons who excrete typhoid bacilli in their stools or urine without themselves being sick. Typhoid bacilli are very minute living creatures utterly invisible to the naked eye which can be perceived only when magnified several hundred times. They are the infectious matter which causes illness from typhoid.

Oftentimes bacillus carriers have previously passed through an illness from typhoid and have retained the typhoid bacilli in their bodies. In the case of a great many bacillus carriers, however, no previous illness from typhoid can be proven. The reasons for this may be very varied. Either the sickness was so slight that it was not noticed or in reality no such sickness occurred. In this case the bacillus carriers took the bacilli into their systems through contact with some person suffering from typhoid, without falling ill themselves.

Healthy persons may be infected by bacillus carriers and suffer as a result from an illness of typhoid.

Unfortunately, up to the present, no means have been discovered of preventing bacillus carriers from excreting the bacilli in their stools,

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but the excretion of bacilli in the urine can be done away with by certain medicines.

Persons who excrete typhoid bacilli in their stools must therefore, in order to protect healthy persons in their vicinity from infection, make the typhoid bacilli excreted by them harmless.

This can be done in the following manner:

The typhoid bacilli in the contents of the pit in the toilet they use must be killed off by lime water on every occasion before the pit is cleaned out. (This is called "disinfecting the contents of the pit.") For this, great quantities of lime water are needed, about the fourth part of the content of the pit, and in order to increase the efficiency of the disinfection still more, the contents of the pit and the lime water are to be thoroughly stirred up together by means of a pole. One day later the pit can be cleaned out. The lime water is to be prepared in the following manner: For example, 1 kg. of good burned lime is to be covered with ¾ of a liter of water, whereupon it will swell up, hiss and dissolve into powder. (This is called the slaking of the lime.) Then ¾ of a liter of water are added and the lime water is now ready for use.

The whole toilet, especially the seat, must be kept very clean. Frequent washing with soap and water of the seat and door latch is to be recommended.

In order to protect the hands as far as possible from any pollution with excrement, paper, preferably toilet paper manufactured for this purpose, must be kept in readiness hanging in the closet, with which to clean the anus.

But despite all this the hands must be thoroughly cleaned after the physical functions have been attended to, either by means of water, soap and a brush, for which purpose, if possible, it is best to have a wash basin with soap, brush and towel installed in the toilet itself, or else by a thorough rubbing with alcohol (simplest of all, methylated spirits). For this purpose, a case containing a cloth soaked in alcohol is to be constantly carried in the pocket. Such a case is very practical because on journeys and in places where wash accommodations are lacking it fulfils its purpose. It can be obtained free of charge from the Bacteriological Institute in Trier. Alcohol, which destroys the typhoid bacilli, must be added whenever necessary, and the cloth must from time to time be either washed or replaced by a new one. The safest method of ridding the hands of infectious matter is to wash them and afterwards rub them with alcohol.

Finally, the dirty linen of bacillus carriers must be kept so isolated that nobody can come into contact with it and must be boiled before it is washed. The dirty body linen always contains impurities, even if these are invisible. The boiling destroys the typhoid bacilli.

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If bacillus carriers conscientiously follow these regulations, as they are legally bound to do, then those in their vicinity enjoy a sufficient protection against infection.

The idea of many persons that a typhoid illness is caused by a cold, some fault in the diet, etc., is erroneous. Typhoid is caused only by the taking into the system of typhoid bacilli. These come from persons ill with typhoid or from bacillus carriers and are communicated to other persons by direct contact or indirectly by the intermediary of water, milk, food, linen, excrement, pus, contents of toilets, etc., when such things are polluted with typhoid bacilli by persons ill with typhoid or by bacillus carriers. Moreover, it should be remarked that illnesses from typhoid may take a very varied course as regards severity, some very grave and some very slight. Oftentimes the illness is so slight that it is not recognized as typhoid even by physicians; oftentimes there is only slight discomfort for a few days. Slight illnesses are, however, just as dangerous for healthy persons in the neighborhood of the sick person as severe attacks, because they are just as infectious.

Bacillus carriers must on request from time to time have their evacuations bacteriologically tested, in order that it may be determined whether the excretion of typhoid bacilli is still continuing. Experience has shown, however, that several negative tests of the evacuations of bacillus carriers do not justify the assumption that the excretion of bacilli is ended, for very often it again sets in after a greater or lesser length of time. Only a rather large number of negative findings at long intervals of time afford some certainty that no more bacilli will be excreted.

In order, however, to protect the bacillus carrier from evil gossiping on the part of silly persons and from economic injury, the knowledge of his condition should be kept, as far as possible, from the public. But just so much more because of this is the bacillus carrier bound by his duty to his fellow-men to protect them by conscientiously carrying out precautionary measures prescribed.

The appendix contains a short summary of the measures thus prescribed.

[*Translation*]

APPENDIX

Royal Bacteriological Experimental Institute
Trier, Lindenstrasse 20, Telephone 1049.

REGULATIONS FOR TYPHOID BACILLUS CARRIERS

Bacillus carriers, in order to protect healthy persons in their vicinity from the danger of infections, must take the following precautionary measures:

1. Always carry a case containing a cloth soaked in alcohol (methy-

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lated spirits) and, after attending to the physical needs on each occasion, rub the hands thoroughly with alcohol.

If such a case is not used, always, after attending to physical needs, wash the hands thoroughly with water, soap and a brush. The safest method is to wash the hands and afterwards rub them with alcohol.

2. For cleaning the anus paper should be used, preferably toilet paper, manufactured expressly for the purpose, which must always be kept in readiness hung up in the toilet.

3. Soiled body linen is to be kept separate and is to be boiled before being washed.

4. The toilet is to be kept clean. On every occasion, before it is cleaned out, the contents of the pit must be disinfected with lime water.

Frequency of typhoid carriers.—The figures of the work during the anti-typhoid campaign show that at least 3 to 4 per cent of typhoid patients become carriers. The number of carriers actually under observation gave a rate of 1.6 carriers to every 10,000 of population. The number is, of course, actually greater than this, *i. e.*, there were many undiscovered carriers, as is shown by the fact that, as a result of a house to house canvass in a limited area, 7 additional and unsuspected carriers were found.

Effect of anti-typhoid campaign on typhoid rate.—The typhoid morbidity rate per 10,000 during the years 1904 to 1911 is shown as follows:

1904	1905	1906	1907	1908	1909	1910	1911
11.0	8.3	7.8	6.4	5.3	4.0	4.5	4.8

There has, therefore, been a decrease of more than 50 per cent during seven years of the campaign. That this decrease was not due to natural periodical variations is shown in the following similar figures for the same years for Prussia:

1904	1905	1906	1907	1908	1909	1910	1911
4.3	4.5	4.5	3.9	3.4	3.3	3.1	4.3

that is, there was very little variation in the typhoid morbidity rate for the whole of Prussia during the same period. Results of the anti-typhoid campaign other than the decrease in the typhoid morbidity and mortality rate may be enumerated as follows: Sanitary improvements and its effect on the general health, economy and well being of the people, the advance in knowledge of typhoid fever clinically and epidemiologically and the demonstration of the importance of the typhoid carrier.

It may be asked: How much of the decrease in the typhoid rate has been due to general sanitary improvements and how much to the efforts along the lines of early and positive diagnosis, detection and control of carriers and educational propaganda? It is impossible to answer such a question satisfactorily.

(To be continued)

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VITAL STATISTICS IN THEIR MILITARY RELATIONS

By Captain A. L. BENEDICT
Medical Corps, United States Army

WHILE an article of this nature, at this time, may be compared to the autopsies of enthusiastic card players, it may be justified by the old precept to prepare for war while at peace. It is perhaps especially advisable to prepare for war when so many believe that a major war will never again occur, and when the lessons of war are so fresh in our minds. So far as possible, the present discussion will be limited not only to the medical aspect but to the particular phase of the subject usually included in the meaning of vital statistics. The article can, however, scarcely be claimed to a statistical one, since accurate statistics are not yet available and, for many of the belligerent populations, probably never will be. It is intended rather to emphasize the importance of more thorough study of vital statistics by competent authorities, with special reference to military emergencies and to reconstructive problems following war.

It is obvious that military power depends to a high degree on man-power and this, in turn, on population. In the past, with conflicts between nations of vastly differing degrees of civilization and military equipment and organization, potential man-power was a relatively unimportant factor; but, from the present time onward, such differences will be of comparatively minor importance, since, even when races more or less inferior in culture or kultur are involved, they will be trained and utilized by stronger nations, as they have been in the recent past. The only conceivable circumstances in which racial superiority will be a prime factor in determining the use of a small against a large potential force, will be in uprisings of very minor importance scarcely deserving the term war.

Ultimately, in the recent war, the tally of populations was about as follows:

	Millions
Total population of world	1,691
Strictly neutral countries	132
Countries that broke relations with central powers but did not declare war and, hence, were factors only economically and influentially	40
Central allies	177
Entente allies	1,342

The last two numbers might be taken to show that German military experts did not lay much stress on man-power, but they represent the conditions existing after nearly three and a half years of conflict, and it

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is questionable whether, in the preliminary plan of the war, the high degree of preparedness of Germany was considered even by her own authorities as balancing any great numerical superiority. So far as can be learned, it was not foreseen that more countries than France, Russia, Serbia and Belgium would be engaged; it was thought that Italy would at least remain neutral and that Great Britain, if drawn into the war, could not depend on her colonies.

The actual experience of the present war may be interpreted in opposite ways, so far as the relative importance of man-power is concerned. On the one hand, it may be claimed that artillery, submarines air forces, expert scientific study directed along practical military lines, discipline, etc., have assumed an importance never before equalled and outweighing mere numerical force typified by infantry. On the other hand, it may be argued that every novel means of warfare introduced by Germany, either representing legitimate advances in military science or contrary to the principles of civilized warfare, ultimately reacted to her disadvantage. There seems to be no question but that Germany counted mainly on the results of a sudden drive by a perfected war machine; that the war soon became one of attrition, which is only another way of saying that man-power was to be the ultimate factor in the decision, yet that both sides depended largely upon means which would have nullified man-power if they had been immediately and brilliantly successful, or if they could have been pursued with gradual success and without being met in kind or by other means by the opponent. So far as one may apply the lesson to the future the opinion may be hazarded that no major war—and if the league of nations becomes a practical factor, no war beyond the legitimate police work of a government against internal dissensions can remain local—can be prosecuted without a large element of human and economic force on either side; that any device to nullify the importance of man-power will be met by equal intelligence of the opponent, so as again to reduce the conflict to one of man-power. In fact, it may almost be claimed that potential man-power will either prevent war or develop it into a world struggle which will be determined by the same factor.

It was suggested, during the recent war, that Germany had designedly camouflaged her population in order to give a false impression of relative weakness. While this suggestion is decidedly opposed to the quite well-demonstrated intention of securing a victory by a sudden move against less prepared neighbors, it deserves consideration. It can scarcely be claimed that Germany or any other country, at least in Europe, watched by countries more or less jealous, apprehensive and equipped with efficient secret services, could have distorted the popula-

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tion or other vital statistics of frontier areas or small towns with quite fixed populations. Any minimizing of statistics would have been limited to a few large centers or to peculiarly isolated rural districts—if there be any such. To publish accurate statistics in the one case and reduced statistics in the other would have led to a most complicated system of garbling all other statistics, as of deaths, births, marriages, etc., even of freight movements, importations and the like. It is almost inconceivable that any such scheme could have been carried out without detection, and detection would have been a warning which would have been alarming when actual boasting of warlike ambitions were ignored.

It is often called a military axiom that the militia of a country is 10 per cent of its population. Of course, in the brief conflicts of the stone age, a community could and often did bring into conflict both sexes and all ages from early childhood to extreme age. In the Revolution and the Civil War, our own country used about 11 per cent of its population, but, in the former especially, most of the individual terms of service were short and, in the latter, the actual number under arms at any one time did not much exceed 5 per cent of the population. In the war just ended, which was not of long duration for us, we were beginning to feel the reduction of man-power behind the army, when we reached 3.7 per cent mustered in.

The statement just made can scarcely be termed an axiom in the sense in which the word is used in logic, since it both requires and is susceptible of proof. Discounting both chivalry and physical unfitness, and having regard only for economic reasons, no civilized war can depend upon any considerable Amazonian force. This fact at once reduced the militia to 50 per cent, though our own country, on account of depending upon immigration for nearly if not quite half of its increase of population, and the obvious influences determining an excess of male immigration, had and has slightly more than 50 per cent of males. However, it is worth noting that the military census of New York State, which is usually regarded as the immediate location of the plurality of recent immigrants, gave only 2,914,909 males against 2,901,060 females between sixteen and fifty. In round numbers, all the males from twenty to thirty-one or thirty-two comprise 10 per cent of a community; an extension of the age limit to forty increases the proportion only to 15 per cent; all males up to fifty comprise 20 per cent of the population; and an extension of the age limit to sixty-five brings it up to 25 per cent. For any one age-year near the lower limit of military age, the males may be considered as 1 per cent of the entire population. It might appear, therefore, that by impressing the entire manhood strength of a nation, the militia might be brought up to 25 per cent of the whole population.

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This would be impossible, however, for two reasons—a considerable margin must be allowed for physical incapacity, and a liberal supply of sound men must be left for the heavy labor behind the strictly military machine. Neither the general upkeep of a country can be maintained by military rejects, nor even the special work necessary to maintain the equipment of the army. If anything, the advance of military science has reduced the potential militia strength of a given population, by increasing the demands for skilled workers to produce armament and ammunition and other supplies.

Rejections for physical causes averaged 29.1 per cent of the first draft for the whole United States. On this basis, the draft of the entire male population from twenty to forty would yield less than 11 per cent for the available militia, even if no other excuse were allowed and if the entire force behind the Army, women, children and men over forty, were capable of performing the various functions necessary. However, it must be conceded that, in an emergency, many of the men classed as physically unfit could be used in the Army, and not necessarily for limited service. A considerable proportion of rejections was for some form of flat feet, easily palliated, if not actually remediable. Arbitrary standards of height, weight, chest expansion, dental, visual and auditory defects not sufficient to detract from the usefulness of a man for routine service in the ranks, serious but readily operable conditions like hernia and appendix inflammations, also counted in the surprising number of rejections. Surgeons also encountered a good many men who had somehow slipped through the first or subsequent examinations with diastolic cardiac lesions, chronic pulmonary tuberculosis, nearly complete deafness, extreme visual defects, defective joints and amputations, which should have disbarred them from service under even the most lenient requirements. In a few instances, even one-legged men got into cantonments. Some of the conditions were unknown to the victims, others had been concealed for patriotic motives, or had got past the examiners even when so conspicuous that concealment was impossible. Many of the men in limited service were doing quite as hard work as would ordinarily be required at the front, and were more than willing to be graded for unlimited service. It was both pathetic and ludicrous to have men with all sorts of mutilations and organic defects request an "A" rating, in order to be sent overseas, and still more inspiring to one inclined to grumble about hard work or domestic service, to find men willingly performing the hardest manual work, without hope of overseas service, when they could legitimately have applied for sedentary assignments or discharge.

The great discrepancies in the percentages of rejection in different

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local units can scarcely be explained except by the personal equation of the examiners, and they suggest a thorough investigation and deliberate planning of the work in case of universal training or another military emergency. For example, Erie County (including Buffalo) and Monroe County (including Rochester) would seem to be strictly analogous, although the former county and city have about twice the population, respectively, of the latter. Yet the rejections for the former were 35.4 per cent and, for the latter, 21.4 per cent. Or, compare two rural counties, within a few miles of each other and with no obvious factors determining a difference in relative health, Livingston with 20.7 per cent of rejections and Schuyler with 49.3 per cent. Generally speaking, the percentages of rejection in New York State were higher for the rural than for the urban districts, but no consistent variation can be made out on any basis that occurs to the writer.

These various facts indicate that, in case of necessity, the percentage of rejection for physical reasons may be very much lower than our statistics apparently show. Yet it can scarcely be doubted that any nation will have at least 10 per cent of defects of so high a grade as to disqualify not only for active military service but for such work behind the army as might liberate an able-bodied man as a soldier. Even with the very moderate draft of man-power into the Army reached by this country (3.7 per cent of the population), it was observed in a factory for military material not involving either great strength, high intelligence or special training, and employing female labor in the proportion of about three women to one man, that the problem of securing adequate help was becoming difficult.

Thus, the 10 per cent allowance of military man-power must be accepted as correct, even for such a country as Germany, where practically all the males had had military training and were theoretically still members of the army in some branch, where female labor was already an important economic factor and where there was every effort to utilize the labor of prisoners and of the civilian population of conquered territory.

It was also demonstrated by German experience—at least if reports apparently authentic are reliable—that nothing could be gained by drawing on youths below the ordinary military age, nor by using the mentally deficient. Various other statistics including several countries, to the effect that a seventh or sixth of the entire population had, in the course of the war, been drawn into the army, tally closely with the 10 per cent estimate, plus the annual increments of 1 per cent (less defectives) normally available.

The problem of a war of attrition, therefore, may be reduced to the

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brutally simple one of killing or capturing or permanently disabling the enemy to the extent of 10 per cent of its total population. It would be fallacious to regard the 1 per cent increment of the population, amounting to 10 per cent of the original potential militia, as an offset to the military casualties. This increment will simply offset the wear-and-tear of the army from death due to disease and accident not directly due to conflict and from the physical incapacity common to advancing age at any period of life. This statement requires some qualifications in both directions. Normally, any nation grows by the excess of births over deaths, but such growth is too slow to be a factor of appreciable importance in any such war as that just completed or to be expected, although in the past, when nations seldom engaged any considerable proportion of their man-power in military operations, an army might be kept to a desired standard indefinitely, in the face of even extreme military losses. Indeed nations actually did keep at war for periods of a century or more. In the past, when the normal death rate for the entire population was 20 to 40 per 1,000, the disease death rate for an army often reached 100 per 1,000 in a given campaign of a few months and seldom ranged less than 50 per 1,000 per year. Even in the Civil War, deaths from disease were about double those from weapons, and in the Spanish-American War the ratio was still higher, though, for obvious reasons, this war does not afford a fair comparison to most others. In the present war, practically all of the more enlightened nations participating have kept their disease death rate as low as, or even lower than, in peace, for the same body of men. Nevertheless, if due regard be paid to increased liability to accidents not of strictly belligerent nature and to incapacities resulting from exposure and strain, the depletion of the potential initial militia, exclusive of that of strictly military nature, cannot be appreciably less than in peace and probably will be more. In this country, we are accustomed to think of a growth of population of 2 per cent per annum as normal. As a matter of fact, we have seldom advanced more than 20 per cent per decade, which, for the same reasons as apply to compound interest, represents somewhat less than 2 per cent per annum. A nation increasing by the natural process of excess of births over deaths can scarcely grow at the rate of more than 1 per cent per annum. Even an enormously high birth rate is largely balanced by a correspondingly high death rate, not only because of the inevitable high mortality of infants and young children but because, in various ways, a high degree of prolificity results in a cheapening of human life. It requires no elaborate discussion to show that an army cannot grow, by the normal access of increments of population, faster than the entire population. Even in theory it will grow more slowly, because each

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yearly class of recruits represents the growth based on the survival of births of a smaller population, nearly twenty years earlier. If, however, none of the yearly increment is required to replace man-power back of the army, and 90 per cent of the increment is physically fit, the army should, theoretically, grow at the same rate as the general population, barring military casualties. During the course of a war of fairly long duration, it may be expected that general failure of the food suply, excess of mental and physical strain and partial loss of parental care, acting, say, on boys of fifteen, will in the course of five years seriously diminish the number of the corresponding class who would otherwise be available for military service at the age of twenty. These factors will be operative in increasing degrees as we consider successive yearly classes. It is needless to say that no war under modern conditions can last so long as to render it necessary to consider, for the purposes of that war, the appalling infantile death rate and reduction of births due to the war itself.

During the war, calculations of attrition made at various times after the first year, 1914-1915, when the published reports of casualties were greatly exaggerated, agreed with surprising closeness that the forces of Germany herself would be reduced to the minimum required to hold the western frontier, some time late in 1918 or during 1919. These calculations were based on three methods: collated reports by the German officials, secured by the entente allies and especially England; enumeration of German divisions of known (?) strength; the hypothesis that, in static warfare, the losses on opposing sides would be approximately equal. Toward the last it was possible also to check calculations to some degree by the proportion of German youths of given ages among prisoners. It should be clearly stated that these calculations (several of which were published in the *Buffalo Medical Journal*) were by no means held to be prophetic. In the first place, inaccuracies, unintentional or of propagandist nature emanating from either side, were suspected; in the second place, Germany, like France and Belgium, could have continued fighting in the face of apparently insuperable obstacles to success; for example, a nation could conceivably exceed the 10 per cent militia theoretically possible, just as housewives scrape the barrel when the flour is giving out; or a line could be held with less than the 5,000 men per mile considered necessary; or a small force could retreat to a corner or form a ring without attempting to hold the entire western frontier. Moreover, while the increasing insistence with which the authorities emphasized the probable continuance of the war for many years impressed the writer as did the earlier insistence that the eastern frontier was the crux of the military situation, no sane man can be insensible to the opinion

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of others, and he encountered very few optimists. In fact, within a week of the armistice, he was called a fool for expressing the opinion that Germany was down to about two million troops, beyond the classes of youths called in advance of the normal time, and that it would not be surprising if there were a cessation of actual hostilities by Christmas, 1918. In all these calculations it was assumed that the forces of Germany's allies were being engaged on other fronts so that they could not materially reinforce the western front. One further fallacy of all statistical arguments should be reiterated: it was possible up to the last, and remains possible in case of a future war, that the issue would be decided, not by attrition but by such psychologic factors as have determined sweeping victories among smaller bodies of troops in past wars or by some successful innovation. At the same time, the experience of the present war emphasizes the value of purely statistical calculations in prognosis of a military nature.

Disregarding deaths from disease, which the last two or three major wars have shown to be a factor that can be eliminated down to the normal of peace or even the theoretic normal of humanly perfect sanitation and hygiene, but which may conceivably recrudesce from the use of microörganisms as a definite means of conducting hostilities, practically all military statistics of historic times agree closely as to the proportion of fatalities from military traumatisms, even with considerable variations in weapons and methods of conflict. The distinction between killed and fatally wounded is mainly an arbitrary one, depending upon the lapse of time between the occurrence of the wound and the moment at which the record is made. About one wound or analogous traumatic casualty in five is fatal; that is to say, the soldier is either found dead or dies within a comparatively few hours after he is picked up. Modern surgery has reduced considerably in certain groups of cases, as abdominal wounds, the number of fatalities, and has reduced to a remarkable degree the slower mortality from sepsis and other processes that may in a sense be regarded as secondary. Ninety per cent of recovery from wounds, excluding those immediately or obviously speedily fatal, has been claimed by several nations, and 75 per cent of recoveries to the degree of resumption of military service within a reasonable period may be regarded as feasible. Apparently the vulnerating power of missiles and other military traumatic agents has been increased so as just about to counterbalance the success of surgery, so far as fatalities are concerned. Our reports, for many months, indeed until the total number of casualties was well above 100,000, showed the peculiar ratio of 1 killed to 3 wounded (approximately), whereas British figures showed a ratio of about 1: 6 (the fatalities apparently being immediate, or practically so,

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and not including delayed deaths). The general explanation that this difference was due to the carelessness of troops of less experience did not explain, for, obviously, carelessness in exposure would result in the same proportionate receipt of fatal and non-fatal wounds. The real explanation reminds one of the ancient conundrum of the small boy: "That boy has the same father and the same mother that I have, but he is not my brother; what's the explanation." It would, of course, be improper to intimate that the authorities had any intention of deceiving; on the contrary, the sensible plan was followed of rushing through the reports of fatal and serious cases first. Ultimately our fatalities were shown to be just about the average.

It is also worth mentioning that although the trench warfare, as anticipated, did determine a disproportionate number of wounds of the head and hands, the disproportion was not sufficient to introduce any notable factor of variance from the practical results of other wars. Even the conditions favoring compound fractures and infections with tetanus, gas bacillus, etc., were so well met by surgical and bacteriologic measures as not to produce a notable unfavorable element in the ultimate results.

It will be noted that the proportion of fatalities to all wounds and of the recoveries to the point of renewed military service, among the wounded, work out so that the deaths almost exactly correspond to the permanent disabilities. Owing to the conditions of the recent war, notably the general loyalty of the troops, the almost complete absence of action by small isolated bodies, and the limited extent of movement, the missing and prisoners were reduced to smaller proportions than in the past, accuracy in identification and reports especially tending to reduce the missing which in past wars have, according to circumstances, largely included unidentified dead or virtual deserters. So far as could be judged from statistics published at various times for various forces, in the recent war, the killed represented very close to 40 per cent of the total definitive losses. A careful study of this point might be of considerable value in the future, granting that war has not been definitely relegated to the past.

Not to mention various earlier statistics (?) which were not at all consistent, what purported to be fairly accurate reports up to October 21, 1918, gave the German losses as: slain in war, 1,580,000; unknown, 60,000; prisoners, 490,000; wounded 4,000,000. Allowing 20 per cent of the last as permanently disabled, this makes a total of definitive losses of 3,130,000, leaving 3,570,000 from the initial militia of 10 per cent of 67,000,000 population. The number of wounded is suspiciously low as a real total. Since the cessation of hostilities, the losses by death have been conceded to be nearly 2,000,000, and if these include the 150,000 to

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250,000 deaths from disease and non-military traumatisms to be expected during the period of the war in the full potential militia (anything like an exact estimate being impossible on account of the wide range of ages included), there is a very close agreement with the foregoing figures, especially as many of the 60,000 unknown must have been killed and as subsequent fatalities and belated reports are to be added. If, instead of the 800,000 permanently disabled according to the former statistics, we allow a number equal to the killed and add the prisoners, we have a total of somewhere between 4,000,000 and 4,560,000 as the total definitive losses, which agree fairly well with the number of troops remaining. But it is obvious that all such estimates from the present standpoint are liable to considerable errors, and that an accurate study from authoritative statistics would be of far greater value.

While a firm determination to fight to the bitter end defies all mathematical methods of prognosticating the duration of a conflict, the very practical attitude of Germany with regard to treaties, laws of war, etc., justified the optimistic view that the termination of hostilities could be thus determined, provided the statistics available were approximately correct. It should not be forgotten that when the supply of reserves, which in modern warfare means something ulterior to troops not actually engaged in conflict, is exhausted, a disabling wound, even if ultimately recoverable to the degree of resumption of active service, is practically a definitive loss. Indeed, a wounded soldier requiring care is a greater loss than one killed. In addition, it is to be expected that a war, especially one mainly of attrition as the recent one and probably those of the future, will end when it becomes apparent that the cause is hopeless. Thus, while it may be conceded that a country may ultimately raise troops more than equivalent to an initial 10 per cent militia, a total of definitive losses, with the inclusion just noted, may be considered a safe estimate of the damage necessary to a determination.

From an entirely different standpoint, the combined psychologic and economic, it may also be considered as probable that it is more than a coincidence that very few intensive wars have lasted more than four or five years. This may represent the maximum of endurance so that peace will follow after some such period, the terms of course depending to a large degree upon the relative potential ability of the two sides to continue hostilities.

Judging both from the after-history of the Civil War, the Franco-Prussian, Russo-Japanese and others, as well as from statistics, the curious paradox exists that, in spite of the virtual annihilation of a country's military force, the handicap of the future is neither so great nor of such a nature as might be expected. One naturally thinks of

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devastated areas, homeless populations, seriously crippled industries, crushing indebtedness and a population deficient in male adults and composed largely of orphans, widows and young women deprived of the opportunity of marriage. Without minimizing the actual losses, there are factors which justify optimism. There will be, in the aggregate, some correspondence between the destruction of homes and ordinary business structures, public and semi-public buildings and the destruction of the population requiring them. Damage to land will be, to some degree, compensated by rest from crop-bearing, fertilization and mineral deposits directly due to warfare. The loss by withdrawal of labor from ordinary industries to warfare will have been met, even during the war, largely by the increased activities of persons not ordinarily contributing much to the total of necessary work, by the reduction of unessential occupation of time, as for amusements, and by conservation of waste. The very necessity for repair of losses felt by nearly every individual and family, will stimulate extra effort, while the military experience will make the most arduous tasks of peace seem relatively easy.

The ultimate influence on population is in still greater contrast to the superficial conception. Granting a war fought to a finish, with complete military annihilation of its initial 10 per cent militia, the results are the killing of 3 per cent of the population, the permanent disability so far as military service in the war just finished is concerned of about 3 per cent more, the temporary loss of a variable percentage captured, of slightly wounded counted as definitive losses merely because of the lack of reserves, while there is a considerable residue of non-combatant troops and combatant units depleted beyond the point of efficiency. Even if the civilian population preserved its normal relations as to sex and age, the loss of 3 per cent of males by death in a comparatively short period would produce no greater disturbance of the distribution of population as to sex and age than has occurred in the United States at different periods, or than exists or has existed at various census dates in comparisons of different states. The permanent disability, from the military standpoint, of 3 per cent more has a comparatively slight influence on the general economic welfare of a country. The great majority of the disabilities, though serious from the immediate military standpoint, do not constitute a material handicap for civilian occupations, at least after the lapse of sufficient time to allow for adjustment between physical handicap and kind of employment, or for more or less complete reconstruction. A considerable minority, as has been observed from our Civil War experience, though complete and permanent so far as the necessities and possible duration of the particular war are concerned, gradually

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recover completely or with a negligible sequel. While, from the individual and family standpoint, the ultimate results of the disabilities may be tragic, in the final adjustment they do not materially interfere with the general economic and industrial strength of the country, and a very small proportion lead to actual dependence.

But it is a grave error to regard the losses of war as limited to the military forces. Various statistics, incomplete as yet, show that there is a tremendously increased mortality, at the extremes of life, among women forced into industries for which they are not fitted or simply on account of the additional stress under which domestic life is carried on. Reproduction is inevitably checked during the period of the war. These factors may or may not balance the losses among males, but they tend to restore the equilibrium of the population with regard to age and sex distribution. It would not be surprising if Belgium showed an excess of losses among women, and at the extremes of life, rather than for the males of military age, and it is asserted that certain parts of Poland have been almost completely deprived of children under the age of five. Distressing as it is, the removal of those elements of the population which are necessarily dependent and not of immediate economic value must, from the cold-blooded standpoint, be regarded as conservative to the recovery of the economic health of a nation. Recent statistics also corroborate the old idea, which has been regarded as a superstition, that there is an excess of male births during and immediately following a major war. At any rate, the actual experience of many countries following a war contradicts the pessimistic predictions of notions of depopulation, lack of man-power for peaceful pursuits, disturbance of sex proportions to the degree of interference with reproduction or demand for polygamy, or even economic bankruptcy.

DETAILED NOTICE OF THE OCTOBER MEETING AT ST. LOUIS, MISSOURI, WILL APPEAR IN AN EARLY ISSUE.

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THE PROBLEM OF HOSPITAL ORGANIZATION, WITH SPECIAL REFERENCE TO THE COÖRDINATION OF GENERAL SURGERY AND THE SURGICAL SPECIALTIES.[1]

By ARTHUR DEAN BEVAN, M.D.

Dr. Bevan has developed a subject of vital importance to the Medical Department. My personal knowledge of the efforts made on this side to outline the scope or sphere of duties of the general surgeon and the specialist is very slight. As to what happened in France I have considerable knowledge. It was learned only by experience that the general surgeon must be depended upon for the first care of battle casualties in forward formations.

In rear of the evacuation hospital the problem changes. To meet this situation the hospital center idea was developed in France. Briefly, this consisted in locating our base hospitals in groups. These groups varied in size from 5,000 beds to 25,000. Each group was staffed with the necessary specialists to meet all emergencies. As will be readily seen, this hospital center idea had many advantages, among which was, primarily, economy in personnel. Another very great advantage lay in the fact that a hospital train could be loaded at the evacuation hospital and sent direct to a hospital center with the assurance that all classes of patients could be received and proper care would be assured.

In addition, certain hospitals, at the rear were set aside for the reception of special classes of cases, such as eye injuries, fractures, psychoneuroses, etc., etc.

It will be seen, therefore, that the plan which gradually evolved in the A. E. F. followed very closely that recommended by Dr. Bevan.

SANFORD H. WADHAMS,
Colonel, M.C., U. S. A.

THIS subject has become a peculiarly acute and important one at this time when we are attempting to organize in the most efficient way the medical profession for war. This problem is one which I have studied for ten years or more with much care, and I desire to present briefly my conclusions. My studies of this question were made necessary and have been carried on as the chief of the surgical staff in a large teaching hospital of 400 beds, *i. e.*, the Presbyterian Hospital, Chicago (connected with the University of Chicago), where this question, the relation between general surgery and the surgical specialties, had to be met and solved in a practical way and the solution arrived at tried out in actual experience.

Further, I have studied this problem as an educational one in my position as chairman of the Council on Medical Education of the American Medical Association, especially in connection with the work

[1] The following article by Dr. Arthur Dean Bevan was published in the transactions of the American Surgical Association, 1918, but inasmuch as the circulation of this is limited and the interest of the article applies to many more than those reached in this way, we print it by Dr. Bevan's permission and through the courtesy of the American Surgical Association.—THE EDITOR.

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of developing a medical curriculum, which was done by a committee of ten representing the ten medical subjects into which we more or less arbitrarily divided the subjects taught in a medical curriculum.[2]

Further, as a member of the American Society of Clinical Surgery, I have had the opportunity of obtaining, by personal contact with the most active teachers of surgery in the twelve or fifteen best surgical clinics in this country, the scheme or organization adopted in our best hospitals and medical schools.

I have also studied this problem in the best surgical clinics in Great Britain, Germany, Austria and Switzerland.

Further, I have studied this problem as a railroad surgeon for a number of years in handling traumatic cases occurring on more than 2,000 miles of track. I was responsible for not only the immediate care of the injured but also had the responsibility of following the case until complete recovery of the patient, or until he was able to resume his employment, or, if he were permanently injured, until I was able to determine this fact and the extent of the disability.

In this work the coöperation of general surgery and the surgical specialties was frequently called for. The gross traumatisms occurring in railroad work more closely resemble the character of the injuries occurring in war than any other group of cases handled by the civil surgeon.

Extent of Problem.—As a probable or at least possible requirement, let us say that it is necessary to provide the 35,000 medical officers for the Army and 7,000 for the Navy. The medical departments of the Army and Navy have adopted a general plan which contemplates giving to the American sick and wounded soldier in this war the benefit of the services of expert medical specialists.

I believe this is a distinct step in advance, and I am in hearty sympathy with this general proposition as outlined. There is, however, very great danger that it may lead to bad organization, to confusion, to friction, to poor service to the wounded American soldier, to great extravagance, to failure to employ to the best advantage the surgeons and specialists who are available to the Government for this work, unless in the administration of this new plan the work of the general surgeon and surgical specialist is properly organized and coördinated. There should be no difficulties in this coördination if the simple plan adopted by our best organized hospitals the world over is accepted and applied to our present war condition. A grave danger arises only when some new experiment is undertaken in this emergency and an effort

[2] See Report Council of Medical Education, Fifth Annual Conference, held April 5, 1909, in Chicago, published in American Medical Association Bulletin, September 15, 1909.

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made to create on short notice new specialties and new specialists and to broaden the work of existing specialists to include work which they are not familiar with and not competent to undertake; and when the effort is made to draw away from the limited number of well-qualified general surgeons available at this time a large number of men and convert them on short notice into men specializing in a narrow field, because they can be of so much greater service as general surgeons, covering, as they should, the broad field of gross traumatic surgery. No one can question the great value of the work done by surgical specialists. Surgical specialists have earned a recognized place for themselves in surgical practice. The point at issue is simply how general surgery and surgical specialties as they exist today should be correlated so as to produce the most efficient organization.

The concrete specific problem is: How should a great mass of surgical cases, in large part traumatic, shell and gunshot wounds, be handled by a group of general surgeons and surgical specialists so as to bring about the best team-work and the best results for the patients both from the standpoint of the immediate surgical care and the end-result of restoring the soldier as completely and as early as possible?

In the handling of gross surgical traumatisms such as occur in war the first and immediate care of the case is the duty of the general surgeon. In this immediate handling no anatomical division into specialists of the brain or specialists of the joints, etc., can be made. A soldier who receives a fracture of the skull and an injury to the shoulder-joint cannot be handled from the standpoint of practical administration by a specialist in brain surgery and a specialist in surgery of the joints, an orthopedic surgeon, but can be much better handled by a well-trained general surgeon who under the same anesthetic and in the same hospital takes proper care of both his brain and joint surgery. The same general principles and the same technique are involved in gross traumatic surgery. It makes no difference what part of the man is injured, whether the head and neck, the chest, the abdomen or the extremities.

The well-trained general surgeon is better qualified than anyone else, and is in fact the only one who is at present properly qualified to take charge of gross surgical traumatisms. The surgical specialists, such as of the eye, ear, nose and throat, the orthopedic and the genito-urinary surgeons of the country, are not qualified to properly take care of the gross traumatisms of the special anatomical field in which they specialize. They have had no experience and no training in this work. For example, a gross traumatism of the face and neck, involving the

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nose and external ear, the larynx or esophagus, must be handled not by an ear, nose and throat specialist but by the general surgeon, because he is at present the only man who has had any training and experience in this work. And these very traumatisms are, as a rule, complicated with injuries of important vessels and other anatomical structures, such as brain and nerves, with which the ear, nose and throat man is not familiar and therefore not competent to handle. The same is true of the immediate care of the gross traumatisms of joints. These must be handled in this war by the general surgeon because he is at present the only man qualified to do this work. The orthopedic men of the country do not handle and never have handled to any extent gross traumatic lesions of joints, such as gunshot wounds, and are not competent to do so. Here, again, many of these cases are complicated by other lesions, as fractures of bones, injuries of great blood-vessels, injuries of other anatomical fields, such as head, chest or abdomen, and the practical administration demands that the first care and, as a rule, the care of the joints until the immediate risk of the life and limb are properly attended to, must be in the hands of the one man who has had the experience and training to handle these cases, *i. e.*, the general surgeon.

The same is true of the gross traumatisms of the genito-urinary system. The genito-urinary men of the country have had, as a rule, little or no experience in handling the gross traumatisms, shell wounds and gunshot wounds of the kidney, bladder and external genitalia. Here, again, these gross traumatisms of the genito-urinary system are, as a rule, almost always in fact not limited to this special anatomical field but involve other injuries of the abdomen, fractures and so forth with which the genito-urinary man is not familiar. These cases always have been and can best be handled in this war by the general surgeon.

Maj. Edward L. Keyes, Jr., in an article in the *Journal of the American Medical Association*, August 3, 1918, "Present Status of the Urology of War," makes this fact very clear. He says:

> Those of us who arrived later in France after the American Expeditionary Forces had begun to establish themselves there looked around for work to occupy a urologist. . . . The situation we found was unexpected. In the armies of our allies there is practically no urologic surgery as such. Among the English the urological surgeons have all become general surgeons. . . . The reason for this situation is to be found in the material that presents itself to the surgeon's hand. At the front there is no genito-urinary surgery as such. . . . Penetrating wounds of the abdomen which involve the kidney or the ureter usually inflict wounds of far greater importance on such adjacent organs as the lung, the gastro-intestinal tract, the liver or the spleen. . . . Thus at the front the wounds of the urinary organs inevitably fall into the hands of the general surgeons. . . . Throughout this war the specialty of surgery of the genito-urinary organs will doubtless continue in large measure as a pro-

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vince of general surgery. The expert knowledge of the specialist will be chiefly useful at base hospitals, but the urologist himself will be the chief gainer, for he will be pushed into general surgery of the most active sort and will thereby broaden his horizon and his surgical capacity."

The same is true of the gross traumatisms of the brain, cord and peripheral nerves. The immediate care must be in the hands of well-trained general surgeons. In this country and the world over these traumatisms are handled by the general surgeon with the aid of an expert neurologist. The general surgeon regards as one of the important subjects in his field gross traumatisms of the head, including brain injuries, just as he does the gross injuries of the chest and abdomen. This subject has been studied and developed by general surgeons working with neurologists. There are no surgical specialists in traumatic surgery of the brain and cord. There are in the entire world but a few men who specialize in brain surgery, and almost all of their work is limited to brain tumors, epilepsy, Gasserian ganglion, hypophysis work and other pathological conditions. As far as I know, but two men, Harvey Cushing and Feodor Krause, of Berlin, are the only men limiting their work to brain surgery. A number of general surgeons, such as Von Eiselsberg, of Vienna, Charles H. Frazier, of Philadelphia, and Sargent, of London, have done outstanding work in the surgery of the brain. But there are, however, in the country no group of men who specialize in brain surgery, and for the traumatic surgery of the brain in this war we must depend on well-qualified general surgeons.

In regard to oral surgery as applied to gross traumatisms of the mouth, jaws, tongue, etc., these should be handled immediately by a well-trained surgeon. Working with him should be a dentist, with special training in jaw fractures.

The immediate care of the gross traumatisms coming to the regimental, aid, dressing stations, field ambulances, evacuation hospitals and base hospitals must be therefore under the direct control of the general surgeons. In the staffs of the evacuation hospitals and base hospital there should be, if practicable, a specialist in eye, ear, nose and throat work, dentists with special training, and a man who can do good cystoscopic work. There should be among the group of medical men a neurologist. The evacuation hospital or the base hospital is not the place for a specialist in brain surgery nor for a specialist in orthopedic surgery. There might very properly be one or more of the general surgeons who might make under the direction of the chief surgeon a special study of brain cases, one or more who might make a special study of fractures, and one or two who might make a special study of joint injuries, but all of these men should be competent to cover the entire field of traumatic surgery and should be competent to handle in

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the same patient the brain lesion or joint lesion, and an injury of the chest, the abdomen and the kidney or bladder. These men should be a part of the general surgical division.

What is the special service that can be rendered in this war by the hundreds of surgical specialists who come into the medical service from civil life? It is exactly the same as that rendered by them now in their work in civil hospitals. The eye man, the ear, nose and throat man, the genito-urinary man, the dentist, etc., should not take immediate charge of the gross traumatic surgery but do the special work in which he is trained and which he is qualified to do. This work he should do in the casualty and base hospitals at the request of the internists and the general surgeon, as the surgeon in charge finds that the need for their services arises in the proper handling of a case. There is no reason for any friction in this work if handled in this way. The best of team-work can be done just as it is being done in our well-organized hospitals in civil life.

The danger of friction arises only when some artificial division and relationship is undertaken or some experiment attempted. An attempt at artificial division and relationship has been introduced as a result of the enthusiasm of some surgical specialists and as a result of their earnest desire to be of the greatest possible service. In my analysis of the situation this has developed in three fields: In surgery of the brain, in plastic surgery of the face and neck, and in orthopedic surgery.

Take, as an example, the surgery of the brain. An attempt to make this a surgical specialty and separate it from general surgery is a mistake and not for the best interests of the patient, or the hospital organization, or the medical services as a whole. I submit as proof of the above statement the following:

There is no such thing in existence today as a specialty of brain surgery. There are today nowhere in the world any considerable group of men devoting their time to surgery of the brain. Ninety-nine per cent of the brain surgery of the world is done by general surgeons working with neurologists. The few men who have specialized in brain work have limited, as I have already stated, their work largely to pathological surgery of the brain tumors, epilepsy, Gasserian ganglion, hypophysis, etc., conditions which will not be met with in war surgery. The traumatic surgery of the brain is done by general surgeons, and is a well-recognized and well-developed part of general surgery. Any attempt to make in this war and in our Medical Corps a division of brain surgery would be an experiment. It would be artificial and would be harmful, as the only way such a service could be created would be by taking a large group of our best qualified general surgeons and assigning

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them to this limited specialty. This would rob the general surgical division of a large number of our best general surgeons who could be of much greater service acting as general surgeons and covering at the same time the traumatic surgery of the brain, which they are well qualified to do. In discussing this matter I find that the general surgeons who have been offered this special assignment are desirous of doing not only brain surgery but general surgery, and they regard the artificial division of brain surgery from the surgery of the chest and abdomen and extremities as a serious mistake and not advisable. In carefully looking over this subject one finds abundant opportunity for service of our surgical specialists. The important point is to utilize them and our general surgeons in the way that they may be of the most possible service. What scheme of organization and administration should be adopted?

1. In handling the gross traumatisms of war at the casualty hospitals and base hospitals the surgical work should be done by the general surgeons with the assistance of eye, ear, nose and throat and genito-urinary men, who will at the request of the general surgeon do what work properly belongs in their specialty, the work they are accustomed to do in a well-organized civil hospital.

2. There should be back of the base hospital special hospitals officered by specialists. In these special hospitals, eye, ear, nose and throat, orthopedic, genito-urinary, brain and oral, the specialists should be in complete control and the relationship between the specialists and their associates in medicine, surgery, eye, ear, etc., should be reversed from that existing in a base hospital, these latter men coming into a case at the request of the specialist who is at the head of the hospital staff.

The dangers of attempting to develop at this time, from well-trained general surgeons, surgical specialists in the fields of brain surgery, plastic surgery of the face and orthopedic surgery become evident when we analyze the situation from the standpoint of the number of good general surgeons there are in this country available for military service. The orthopedic division of the Army contemplates securing 600 or more men to specialize in orthopedic surgery, and, recognizing that there are but few orthopedic men in the country qualified to do this work, they intend to draw their supply from our best general surgeons. The brain division contemplates securing 300 men, and, as there are practically not more than two or three men in the country who could be regarded as brain surgeons, they contemplate drawing upon the supply of well-qualified general surgeons for this purpose and are attempting to secure the very best men possible.

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The division of plastic surgery of the face contemplates securing in the same way a number (as yet undertermined) of our best general surgeons for this work, let us say 100 men. This makes altogether 1,000 men. The number of well-trained general surgeons of the country who are capable of acting as chiefs of the surgical work of a large hospital, say of 1,000 beds, and who are available for military service, is certainly not more than 1,000 men. If the plans of these special surgical divisions were carried out, it will rob the general surgical division of the very men who should be placed in charge of the general surgical work of our military hospitals.

The great bulk of these 1,000 well-trained general surgeons would personally much prefer to take charge of a general surgical service and do the general surgical work of the head, neck, thorax, abdomen and extremities and not limit their work to a special field such as brain, or plastic or orthopedic surgery. They can be of much greater service to the country if the work is organized so that they can cover this broad field than they could possibly be if their work were limited to some smaller anatomical division.

The practical solution of our problem is to recognize frankly the existing state of facts and the limited supply of well-qualified, general surgeons in this country and use them where they can be o the greatest service. The supply of surgical specialists such as eye, ear, nose and throat, dentists and orthopedists in the country is ample to meet the actual demands of the service, and there is no doubt that a sufficient number of these men can be obtained to do the work which properly comes under these specialties, and for which they are well qualified. There will be no difficulty in securing men in general medicine and general surgery, and the medical and surgical specialties to give our troops the highest class of medical and surgical care, provided the organization is developed and administered along the accepted and best lines. The difficulty presents itself only when in this emergency some new and artificial division of work is attempted, some new experiment tried.

One might stop and ask who and what are responsible for the new and artificial divisions and schemes of organization which have been advocated. The answer to this is easily found in the great enthusiasm and desire of some active men in these special fields to see that the American soldiers receive the very best possible special service that their specialty is capable of giving. These men have with admirable self-sacrifice thrown themselves actively into this work, with the conception that each brain case should have the special service that an expert brain surgeon can give, and that the orthopedic cases should have the special services that an expert orthopedic surgeon can give.

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With this idea in view they have suggested the experiment of making in the midst of this war emergency several hundred special brain men and orthopedic and plastic specialists out of general surgeons by about four to six weeks' brushing up courses in these special fields.

The answer to this is that this is no time to experiment. A few special brain and orthopedic and plastic and oral hospitals should be established well back of the line, where surgical specialists can give properly selected cases the benefit of their services. But this is no time to experiment with a new scheme or to reorganize along new and untried lines the field of general surgery and surgical specialties. The American soldier when first wounded should have the benefit of the services of our best general surgeons, such men as Blake and Brewer, Finney and Crile and the many other general surgeons who have made their services to the Government available.

The practical difficulties arising in the administration of a new and experimental scheme of having surgical specialists take immediate charge of the wounded are insurmountable.

If the war continues for some time, there will be unfortunately plenty of work for all of our general surgeons and surgical specialists.

The question which must be answered in this particular problem is: How can the surgical work in our military hospitals be so organized and administered and correlated that the wounded American soldiers can receive the best possible service, and how with the material on hand can we use our general surgeons and our surgical specialists to the best possible advantage? It is not a question of limiting or enlarging or magnifying the importance of any special field, but a question of doing the best possible team-work for the benefit of the wounded. With that single idea in view I desire to present the following summary of the facts involved in the problem with an outline, not of a new scheme of organization and administration, but of the simple plan of organization and administration which is today recognized the world over as the generally accepted and best scheme, and to urge that in this great war emergency, in the organization of our surgical work, this accepted plan be followed, and that any experiments and rearrangements be left to the slow process of evolution after the war.

The organization and administration which should be adopted in order to secure the best coöperation between general surgery and the surgical specialties:

1. We should adopt the plan of utilizing the services of both our general surgeons and our surgical specialists.

2. The scheme of organization and administration of the various surgical divisions in military hospitals should be along accepted lines as in our best civil hospitals.

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3. In the hospitals close to the line, including casualty and base hospitals, which will have the early management of the gross traumatisms from shell wounds and small-caliber bullets, the organization should be so planned that the general surgeons should have charge of these gross traumatisms irrespective of the anatomical location, and the few surgical specialists on the staffs of these hospitals should do such work as is assigned to them by the surgeon in charge.

4. Well back of the line there should be developed special hospitals, orthopedic, head surgery, special fracture hospitals, etc. In these special hospitals the surgical staff should be so organized that these specialists have complete control of the management of the cases. There should be on these staffs a few men representing their special fields, such as internal medicine, neurology, eye, etc., and these men should do such work as they may be called upon to do by the staff of specialists who are in charge of the hospital.

5. The effort made to establish schools in special departments giving special instruction, in surgery of the brain, fractures, orthopedics, etc., should be continued and amplified as much as possible. These schools should be devoted to special fields of surgery and should give short courses reviewing the work of a special field, especially from the standpoint of the experience obtained in this present war. These schools should not attempt the impossible task of creating, in a short period, specialists in these particular fields, but should be regarded as furnishing courses of instruction to general surgeons which will make them more competent in these special fields of work.

6. The specialists in charge of the special hospitals to be created well back of the line should be drawn, not from the students taking these special courses but from the body of our well-trained specialists who are now available.

In the organization of the reconstruction hospitals which are being created in this country for the important purpose of reconstructing and reëducating the wounded men sent back from France the same scheme of organization should be adopted. The work will cover the entire field of medicine, and it cannot be placed properly under the control of a single specialty. It will require the coöperation of all departments of medicine and surgery, and the medical organization, therefore, must be along the same broad lines that have been found by experience practical in our best civil hospitals.

Finally, I believe that it is possible to secure for the American soldier, provided we adopt the proper organization, better medical and surgical care than has ever before been furnished to any army in any country, because I believe that never before have so many well-trained medical men made their services available to the Government.

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SERUM TREATMENT OF EPIDEMIC CEREBROSPINAL MENINGITIS, AT CAMP DEVENS

By Captain A. H. TERRY, Jr., M.C., U. S. A.
Base Hospital No. 208, A. E. F.

CONSIDERATION OF TYPES

FOR convenience of reference there may be considered to be four types of epidemic cerebrospinal meningitis.

1. *The mild case* is the so-called sporadic type which may occur as an isolated case or as a mild case in an epidemic. There may even be a mild epidemic.

2. *The Severe Case.*—This is the more usual epidemic type. Such a case is first seen unconscious or semiconscious, with a high fever, and usually a splotchy rash as well as signs of violent meningeal irritation. These cases literally wake up unconscious or fall out of ranks in a dazed condition. No prodromal symptoms can be elicited in these cases.

3. *The premeningeal cases* are those described by Herrick and characterized by a blood-stream invasion of meningococci without cerebrospinal involvement. They are clinically rare, or at least clinically rarely recognized.

4. *Intermediate types.*

LUMBAR PUNCTURE

Apparatus.—This consists of (1) a reservoir to hold 20 c.c., the best receptacle being the barrel of a 20 c.c. all glass syringe. (2) A piece of rubber tubing 12 to 14 inches long interrupted near one end by a piece of glass through which may be observed bubbles or foreign particles. A good tubing is made from a No. 16 catheter or other moderately flexible rubber with a bore of about 4 mm. (3) A medium-sized lumbar puncture needle with a bore of 1 mm. and length of about 8 cm.; the point should be sharp, but the bevel not long. (4) A metal connection to unite hose to needle.

This is all that is required, but each detail is essential. It is just as important to have a metal connection to fit the needle, so that one does not disturb needle when *in situ*, as it is to have the needle sharp. It is also important to be accustomed to one's own needle and to know where it is in an emergency.

Preparation of Patient.—He should be on his right side with his knees well up into his abdomen, and his back and head arched forward. Someone should be assigned to the duty of having this position main-

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tained. It is essential for precision of puncture that the flat plane of patient's back be exactly at right angles to the flat plane of the bed. For this purpose it is convenient to have a board between the matress and bed frame. Then, with the patient well over on the left side of the bed, there is the best possible opportunity for making a precise puncture. Before scrubbing up, the site for puncture is carefully determined by drawing an imaginary line from the crest of one ilium to the crest of the opposite. The point where this line bisects the mid vertebral line is the point of election. If this point falls on a vertebral process, the space below rather than above is the one of choice; also, it is preferable to be just below the vertebral spinous process than just above it. The space so chosen is usually the 4th lumbar intervertebral space. This exact site is now marked. A convenient method of marking is to moderately dent the skin with the imprint of the thumb nail. A line of iodine is now drawn, down over the spinous processes to fix the mid line; then another line of iodine is drawn from crest to crest of ilia. The whole field is now lightly painted with iodine while the operator scrubs up. The finger dent and cross of iodine should continue to show through the final iodine painting. The puncture is made by first securing the skin against the 4th lumbar vertebra with the thumb of the left hand, while firmly puncturing at the elected site with the needle perpendicular to the flat of the back at plane of entrance. It is possible to keep one's hands off the exact site of puncture, but it is often impossible not to "feel" one's way with the needle between bones into the subarachnoid space. The depth of puncture varies considerably with the musculature of the patient. With a thin patient it is possible to strike fluid with the needle in only half its length, while with a thick back it may require entering nearly to the hilt. Entrance into the canal can usually be felt as a distinct "giving way" through a piece of leathery substance. It is well not to enter unnecessarily far, as there is more liability to bleeding. For this reason, it is well to occasionally withdraw the trochar, when in doubt, to see if there is a flow. A proper flow is usually a free one.

Anesthetic.—The one of choice is cocaine. It should be used after scrubbing up. Ethyl chloride is not satisfactory. If there is reasonable doubt that it will be possible to keep the patient in a proper position either from his active delirium or from the nature of the individual, a general anesthetic should be used. This should be administered before scrubbing up. Chloroform is the anesthetic of choice. It is well tolerated. Ether may be used. Either may be repeated several times if necessary.

Withdrawal of Spinal Fluid.—(*a*) Rapidity of flow. The fluid

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should be allowed to flow freely, as even sudden withdrawal of fluid in cerebrospinal meningitis tends to benefit the patient.

(*b*) Amount. The fluid should be allowed to flow until it is all out or as nearly all as practicable. This may be from 5 to 30 minutes, depending on the size of the needle, the character of the fluid, the pressure of the fluid, and the exactness of puncture. It may be considered practically all out if, after a free flow, it gradually diminishes to 2 or 3 drops per minute.

(*c*) Frequency.—This is largely a matter of judgment, as next to the use of a reliable serum, it is the most important factor toward recovery. Generally speaking, it might be said that puncture should be done and serum administered every 8 hours in the severe case, every 12 hours in the mild case, every 24 hours in an arrested case. Factors governing urgency of repunctures are turbidity of fluid, number of microörganisms present, pressure of fluid, temperature and general condition of patient. The nicest question to decide is when to stop treatment. This is primarily the question for the clinician, not the laboratory man, to decide. At times incalculable harm is done by omitting one treatment because there was no growth reported that day on the previous culture, which may be reported the following day as positive. It is best to first look at the fluid and then at the patient. If the fluid is still cloudy or opalescent, it is safe to presume that there are organisms present unless one is sure that there have been two or three negative reports under good laboratory facilities. A clear fluid generally, or even a clear supernatant fluid over a deposit of detritus in the bottom of the test tube, may be considered as possibly uninfected. The other obvious test is the patient. His mentality usually parallels his spinal fluid. If his mind seems cloudy or opalescent, and if he is dull and apathetic, it is best to presume that he needs more treatment. If his mind is clear and he is bright, the reverse judgment may be rendered. Temperature is only a fair guide. If it is normal, well and good, but there are times when the temperature may not stay normal and yet it is time to stop treatment. This is apt to be so in some of the protracted cases which will not quite get well. Serum seems to have done its all. One instance is recalled where the last fluid withdrawn was reported as positive for meningococci and the patient ran slight temperature, yet on stopping all treatment promptly recovered It is safer, however, to remember the many who die from omission rather than comission.

Serum Administration.—Amount. Practically, 40 cc. may be given to all cases at each lumbar puncture until fluid withdrawn is less than 50 c.c. It is usually possible to withdraw much more than 50 c.c., often over 100 c.c. may be withdrawn, in which case it is advisable to

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inject about 10 c.c. less than the amount removed, and this providing it runs in freely, under gravity.

Frequency. The rules governing frequency of administration were considered under frequency of tapping. Tapping without serum administration is done for diagnosis and to relieve pressure, but an active case is practically always given serum when tapped.

Quality of Serum. Theoretically, the serum to use is the one which has a high agglutinating power for the particular organism infecting the patient, as determined by the laboratory. Practically the serum to use is a polyvalent meningococcus serum of a highly reliable firm, and one which is clinically effective. A good serum is clear, not blood-tinged, and one which is curing the patient. If the serum is not rapidly effective, another should be employed.

Method. Have bottles of serum standing in basin of warm water at body temperature. Couple hose to reservoir and fill same with 20 c.c. of serum, expelling all air. Gently unite hose with lumbar puncture needle, being careful not to alter position of needle. Raise reservoir not over one foot above needle and allow serum to run in by gravity. Add balance of serum as required. It is of the utmost importance not to force fluid in by piston as it is impossible to accurately judge the pressure; collapse and death may thereby ensue. If the serum does not run in, a slight adjustment of needle may be the remedy, but under no circumstances should extra force be exerted. This is especially true if the patient is under anesthesia. On completion of administration the needle is withdrawn and the skin cleansed of iodine with alcohol to prevent irritation. Usually no dressing is required. It is important to personally clean apparatus and flush out all serum before re-sterilization, so as to prevent coagulation of serum and subsequent clogging of needle. This, otherwise, not infrequently occurs.

INTRAVENOUS THERAPY

Apparatus.—(*a*) 200 c.c. graduated glass reservoir with outlet at bottom.

(*b*) Hose attached at one end to reservoir, and metal connection to fit needle at other end. Hose interrupted near needle by piece glass tubing.

(*c*) Metal clamp for hose.

(*d*) Medium-sized saline needle well sharpened and with short bevel.

(*e*) Saline made with freshly distilled water heated to body temperature or slightly above to allow for cooling.

(*f*) Warmed anti-meningococcus serum.

(*g*) Two hot-water bags to have against reservoir and two warm-water bags between which coil of hose is allowed to lie.

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Method.—(*a*) Reservoir and hose are filled with saline, expelling all air. Hose is clamped and reservoir hung about 3 feet above vein intake.

(*b*) With B. P. apparatus or other tourniquet, arm is compressed so as to distend veins without occluding pulse.

(*c*) Bend of elbow is painted with iodine and aseptic field prepared.

(*d*) Most prominent presenting vein is punctured centrally, securing free flow of blood.

(*e*) Tourniquet is released and hose carefully coupled with needle, allowing free flow of saline into vein.

(*f*) When convinced that flow into vein is perfect, serum is poured into reservoir. The exact proportion is unimportant; about half and half makes a satisfactory mixture for dosage control and viscosity of fluid.

Rate of Flow.—Serum should be given slowly and cautiously with the realization that it may be either perfectly bland or more or less toxic to the recipient. The first 15 c.c. of serum (which is 30 c.c. of the mixture) should require 15 minutes, or as nearly as possible 1 c.c. of serum per minute. The remainder of the dose may be allowed to run in more rapidly, if anaphylactic symptoms ensue, so that the entire dosage may be given in not less than half an hour and probably not more than three-quarters of an hour. If no ill effects are noted, the subsequent dosages may be given with more assurance and, on the contrary, if toxic effects are noted, the next one should be administered more cautiously.

Dosage.—Serum is given intravenously for two reasons: (1) to directly combat meningococcenia; (2) to augment the intraspinous treatment by preventing the tendency of the intraspinous serum to make partial escape. The first is fact, the second is fancy. Therefore the serum should be given in the earliest stage of the disease. With a severe case intravenous therapy is given q. 12 h. usually for 2, 3 or 4 doses and then stopped altogether. With a mild case, it is of questionable value. It would, however, seem advisable to give one or two doses to allay the doubt. With the premeningeal cases, it is the treatment par excellence. Single dose = 80 c.c. to 100 c.c.

Anaphylaxis.—In order to avoid this reaction the patient is tested on admission for sensitiveness to serum; 0.2 c.c. of 1–100 solution of horse serum is injected intracutaneously on the forearm; also a similar amount of saline is injected 2 inches away as a control. If there is no local reaction at the end of one hour the test is negative and 1 c.c. of horse serum is injected subcutaneously. This dose is given to desensitize the patient against his subsequent large dose of therapeutic serum. If no ill effects follow this subcutaneous dose within one hour the therapeutic dose may be given. The therapeutic dose, as outlined, is

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administered slowly, however, for the reason that, while the skin test may be negative and the 1 c.c. well tolerated subcutaneously, a large dose may not be fully tolerated intravenously. With this in mind, if at the end of fifteen minutes 15 c.c. have been taken intravenously without ill effects, it is proper to allow the full dose to enter. If 15 c.c. or less are not tolerated well, it is best to stop and wait four hours, when double the amount taken may be slowly tried and then in another four hours a redoubled amount, and so on until full dosage is tolerated. If the initial skin test is positive, it becomes necessary to desensitize the patient by giving increasing doses subcutaneously every hour as follows: 0.05, 0.5, then 1 c.c. If there is no reaction, dosage is given intravenously, begining with 1 c.c. and doubling every half-hour. This is an all-day job and fortunately is rarely necessary.

The symptoms of anaphylaxis are: The patient becomes restless, anxious, breathes rapidly, pulse becomes rapid, perspires, then either improves or continues into collapse or death.

The treatment of collapse is 15 minims of adrenalin solution and 1/50 gr. atropine by hypodermic, preferably by vein. Speed is necessary; therefore it is required to have hypodermic loaded for the emergency.

COMPLICATIONS

Stoppage.—The different localizations of infection which occur as complications of meningitis necessitate the local administration of serum. One of these is of sufficient frequency and importance to warrant consideration. The cerebrospinal fluid surrounding the cord communicates with that filling the lateral ventricles through a small opening in the fourth ventricle. In many cases there is sufficient plastic exudate at this site to seal off the intraventricular fluid, thereby producing pus within the ventricles. This appears to be the tendency in protracted and insufficiently treated cases. Serum intraspinally in such cases does not reach the ventricles. The valuable signs of such a condition are, in order of importance: (1) Rapid decrease in the amount of spinal fluid obtainable, generally from about 50 c.c. to 10 c.c. or 20 c.c., changing from a cloudy color to the color of urine. (2) Decrease in pressure of spinal fluid. (3) Impossibility of introducing more than 10 or 15 c.c. of serum. (4) Rapid rise of pulse rate, as in a case observed: 80 on the fourth day of the disease, 90 on the fifth, 100 on the sixth, 100 on the seventh, 120 on the eighth, 130 on the ninth, death on the tenth. Under such circumstances there may be no evidence of pressure on the fundus and no palsies. These signs should be looked for but not awaited. With such a turn of events the clinician should firmly recommend cranial trephine and lateral ventricle puncture. Which is the more affected

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ventricle is not easily determined, though it is said that cranial percussion elicits a more resonant note over the affected side. The pupils are usually equally dilated. Leg reflexes are unreliable. Palsies occur too late for evidence. After ventricular puncture, the cavity should be flushed with saline, with the view to removing pus and the plug causing stoppage. Serum should then be introduced by gravity and the wound treated surgically. Intraspinal injections should then be renewed, and more serum introduced intravenously as the two procedures become indicated.

Relapse.—Relapses are not infrequent. In some cases it is obvious that the patient was never cured. They should be treated like new cases with increased precaution against anaphylaxis.

COMMENT

The two essentials to success in the treatment of cerebrospinal meningitis are an effective serum and persistent treatment. One omitted dose of serum at the needed time may be a fatal omission. The case calls for unremitting care and courage of conviction. It is never possible to hurry the operation, and half measures are inexcusable.

These observations are made from the cases observed during the winter of 1917 at Camp Devens, U. S. A., and the winter of 1918 at B. H. 6, A. E. F.

Acknowledgment for the idea of intravenous therapy is gratefully made to Maj. W. W. Herrick, M. C. (Camp Jackson); for the considerations concerning serum to the army instruction received at the hospital of Rockefeller Institute, and for the devices of administration to my confreres at each place, as no procedure in the treatment claims originality.

MEMBERS WILL PLEASE HAVE IN MIND THAT THE 28TH ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS, U. S., WILL BE HELD IN ST. LOUIS, MO., MONDAY, TUESDAY AND WEDNESDAY, OCTOBER 13TH, 14TH AND 15TH, 1919.

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METHODS OF HANDLING VENEREAL DISEASES AT CAMP DIX[1]

By Captain CHARLES H. deT. SHIVERS, M. C., U. S. A.

Chief of the Urological Department, Camp Dix, N. J.

THE Camp Urological Department was organized during the latter part of May and the first of June, 1918. Before this time all venereal cases in the camp had been treated at the base hospital. Due to the fact that the men were compelled to take such long hikes when reporting for their treatment and such a large number each day were failing to report, Washington decided it was best to establish a Venereal Department for the treatment of the ambulatory cases of gonorrhea and syphilis in a more central location in the camp. So, on June 24, 1918, the Camp Urological Department at Camp Dix, N. J., was officially opened. A memorandum was sent to all concerned, stating that on and after this date all new cases of venereal disease in this Cantonment should report at the Camp Urological Department for diagnosis, disposition and treatment. All the acute cases, the acute exacerbations, and complications were sent to the base hospital and remained until the acute condition subsided, when they would be returned to the Camp Urological Department to have their treatment completed. At first we were given half of one infirmary in the lower part of the camp, but the department grew by leaps and bounds, and before the last of July, 1918, we were treating as many as 350 to 400 cases each morning, and it was very essential at this time that we have larger quarters for our work. Due to the untiring efforts of Lieut. Col. H. R. Beery, the camp surgeon, we were able to secure three large infirmaries in the center of the camp, so during the month of August the department was moved. At this time we received an appropriation from Washington sufficient to have the interior of these buildings remodeled to suit our purpose; building No. 1 is used for the colored cases suffering from gonorrhea, building No. 2 is for the same class of white cases, and building No. 3 for the examination and treatment of both white and black syphilitic cases.

Each urological building consists of an upper and lower floor. On the first floor we have room 1, where the men congregate to wait for their examination and treatment; room 2 is used for anterior irrigations, where men report twice a day for their astringent injections; room 3 is the

[1] Read before the Atlantic County Medical Society, February 14, 1919.

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record room, and here we keep all the histories of those cases under active treatment, of those discharged, and duplicates of all notes sent to organization commanders and surgeons. In addition to this we have a card-filing system which corresponds in brief to the man's history, giving name, organization, date of admittance, date of discharge, platoon, diagnosis of the case and remarks. The cards are filed like the histories, according to companies, and the days these companies return for treatment. There is one noncommissioned officer in charge of the history room, and he has from five to eight assistants, according to the amount of work to be done. Room 4 is the drug room where various formulas are compounded and drugs dispensed to the patients, a registered druggist being in charge. Room 5 is the laboratory where the microscopic and chemical work is done, and in this room we have various tables for staining purposes, our filing racks for duplicate records, and one stand that will accommodate four microscopes with artificial illumination. In one part of the room there is a cage for guinea-pigs. Room 6 is the cystoscopic and sound room where we have a sterilizing table, a white enamel instrument case and a white enamel cystoscopic table. The top and sides of this room are enameled white, and at the front windows there are curtains to be drawn when cystoscopic examinations are being made. Room 7 is for the examination of urine and urethral discharges. At one side of the room we have a retention pen where patients are seated awaiting reports on their slides; in another corner we have a large sink where the patients pass their urine in wide mouth bottles and where these bottles are afterwards rinsed out. There is one desk in the room where the officer in charge of the examining is seated with his clerk.

CAMP UROLOGICAL DEPARTMENT

Camp Dix, New Jersey

March ,1919.

Form No. 7.
From: Camp Urological Dept.
To: Regimental Surgeon.

Subject:

Diagnosis:
Advice:

That this man be taken from Platoon No. and placed in Platoon No. until further notice from this department.

———————————M. C.

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CAMP UROLOGICAL DEPARTMENT,

Camp Dix, New Jersey

March , 1919.

Form No. 8.
From: Camp Urological Dept.
To: Regimental Surgeon.
Additional Diagnosis:
Advise: Transfer to Base Hospital for treatment.

(Informal transfer, signed by surgeon should accompany patient, who should take with him his toilet articles and must take his own mess kit.)

———————————M. C.

Form No. 9 TRIPLICATE Place this man in Platoon No.

Date ——————— Name——————————Rank———————
Co.———————Reg.———————————————
From:——————————— Diagnosis: ———————————————
Clinical Diagnosis ( ) Laboratory Diagnosis ( )
To: Camp Urological Department. Disposition to be made of case:
1. Transfer to Base Hospital for treatment. ( )
Name ——————————— (Informal Transfer, signed by surgeon, should accompany patient, who should take with him toilet articles, and must take his own mess kit.)
Rank ————Co.———Reg.—— 2. Report at Camp Urological Department for treatment on day or days indicated at————A.M.,————P.M.
Tentative
Monday and Thursday ( )
Tuesday and Friday ( )
Diagnosis: Wednesday and Saturday ( )
1. The above member of this organisation is referred to the Camp Urological Department for advice as to diagnosis and disposition of his case. 3. Disease is in infectious stage. Man should be confined to post. ( )
4. Disease is not in infectious stage. ( )

———————————— ————————————————
M. R. C. M. R. C.

Form 10.

This form must accompany transfer when patient is sent from this Dept. to the Base Hospital.

CAMP UROLOGICAL DEPARTMENT

Camp Dix, New Jersey

Nov. 1918.

Memo: To the G. U. Dept., Base Hospital.

This certifies that , Rank. , Co. Reg. ,has been examined by this Dept. and found to be a case for the Base Hospital.
Diagnosis:
Gram negative intercellular gonococci present.

———————————M. C.

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Form No. 11.

CAMP UROLOGICAL DEPARTMENT

Camp Dix, New Jersey

Date:_____

From: Camp Urological Department.
To: The Surgeon.
Subject:

Diagnosis on Admission:

Condition on Discharge:

Advise: The above named patient is hereby discharged from treatment in this department.

M. R. C.

PRESCRIBING SHEET

No._____ Date._____

ROOMS

No. 17 No. 16 No. 15 No. 13 No. 11 No. 9
No. 7 No. 8 No. 2 No. 3 No. 4 No. 5 No. 6

URETHRAL DISCHARGE

1. C. D. ( )
2. S. D. ( )
3. A. M. D. ( )
4. C. B. D. ( )
5. M. D. ( )
6. W. D. ( )
7. N. D. ( )

URINE

1. Hy ( )
2. Cly ( )
3. Cl ( )
4. Td ( )
5. L. S. H. ( )
6. H. S. H. ( )

TREATMENT

1. SOLUTIONS
   P. I. 5 ( ) Sol. 4 Tid ( )
   Silver ( ) Pill 1 ( )
   Ret. Silver ( ) Pill 2 ( )
   AGNO31-10000 ( ) Pill 3 ( )
   1 p. c. Gtt XX AGNO3 Post Urethra ( )
   Boric Acid Sol. ( )
   T and T ( )
2. SOUNDS
   11 ( ) 13 ( ) 14 ( ) 16 ( )
   18 ( ) 20 ( ) 22 ( ) 24 ( )
   26 ( ) 28 ( ) 30 ( ) 32 ( )
3. MEATOTOMY ( )
4. EXAMINE URETHRA AND REPORT ( )
5. MASSAGE AND SMEARS
   Massage Prostate ( )
   Massage Vesicles ( )
   Prostatic Smear ( )
   Smear from Vesicles ( )
   Examine Prostate and Vesicles and report ( )

Treatment prescribed by.....
Treatment administered by.....

Room 8 is the prescribing room. We have here another retention pen where patients that show obscure conditions or complications are placed, to remain until the crowd has passed, when they can be given a more thorough examination and a proper diagnosis and disposition can be made. On the other side of the room we have two desks; at one the prescribing officer is seated with his assistant, at the other are two clerks who assist with the paper work.

The second floor is divided into two parts; on the right of the building is the treatment section and on the left is the examining section. Rooms 9, 10, 11, 12, 13 and 14 are treatment rooms where posterior irrigations are given, the furniture consisting of a long treatment table where patients can be seated or recline during their treatments; one sterilizing table with one or two coal-oil sterilizers and various white enamel basins for antiseptic solutions, etc. The irrigators are attached to the side of

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the wall over the treatment table and are raised and lowered by means of a pulley. Rooms 15 and 17 are for prostatic and vesicular massage, the furniture consisting of one sterilization table and a stock against the right-hand side of the room, near the window, where the patient places his head during the prostatic and vesicular massage. The physician giving the treatment is seated on a stool behind the patient, and on either side of the stock there is a hand rail that the patient grasps during the treatment. Room 16 is used for anterior irrigations. Along the right-hand side of the wall there is a trough extending from one end of the room to the other, and above this the irrigators are placed with hose attachments. On the left-hand side of the building are examining rooms 18, 19, 20, and 21, where patients receive their first examination and have their histories taken. The furniture consists of a double desk, one side occupied by the officer in charge of the examination and the other by his clerk. There are sinks in all these rooms, with hot and cold running water.

New cases report to this department for examination between the hours of 1 and 4.30 p. m. There are distributed among the organization infirmaries a large number of the urological forms No. 9. When an organization wishes to send a patient to this department, his surgeon fills out the left-hand side of the original and duplicate sheet, giving the date, where the soldier is reporting from, his name, rank, company, regiment, and a tentative diagnosis of the case. The patient then reports to the Urological Department, bringing Form 9 with him, enters the building by entrance A, turns to his left, walks around the corridor to entrance X, where he enters and takes a seat on one of the benches. As his turn arrives for examination he leaves the waiting room by exit Y and proceeds up the stairs and takes a seat in the examining section of the building, remaining there until called into one of the rooms for examination. When he enters the room his clothes are taken down, a careful examination is made of his penis, under surface of his foreskin, inguinal region, the contents of his scrotum, and anything abnormal found is noted on his history. If there is any urethral discharge a smear is made, and, with the smear slip properly filled out, is sent to the laboratory by an orderly for examination and report. He passes his urine in two glasses, the condition of which is noted on his history. His complete previous history, as well as his present condition, is noted in detail. If it be a chronic case or an acute exacerbation of a chronic condition, he is then sent to room 17 for the examination of his prostate and vesicles and to have smears obtained and examined if called for. In this room the prostate and vesicles are examined and their condition noted on the proper sheet in the history. Smears are sent from there to the laboratory for examination and report.

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The patient now reports back to his former room and waits for the report on the smears. The laboratory reports are returned and are attached to the patient's history. The physician during the examination takes into consideration the soldier's history, physical findings and laboratory reports and then makes his diagnosis, which is entered on the history. The right-hand side of the original and duplicate of Form 9 are then filled out by the examining surgeon, giving the soldier's name, rank, company, regiment, and diagnosis. Checks are put in the little brackets to denote whether the diagnosis is clinical or laboratory, and the disposition to be made of the case. If he is to return to this department, the days are checked off. The officer puts his signature at the bottom of each form. This is attached to his history, which he leaves with the orderly in charge of exit B, before leaving the building.

All soldiers reporting here for examination who are suffering from venereal disease are transferred from their organization to the venereal battalions. The 13th and 15th Battalions are for the colored venereals; the 9th and 16th Battalions for the white venereals. Until discharged from this department the soldiers are confined to their battalion area. Each company is divided into four platoons. The soldiers are placed in the various platoons by the examining officers in this department when they report for their first examination. This is noted on the Form 9 and also on the front of the patient's history. Platoon 1 is composed of the acute cases and those suffering from acute exacerbations. This platoon is confined to quarters. The acute cases remain about four weeks and the acute exacerbations about two weeks in platoon 1. After the above intervals in platoon 1 the patients pass to platoon 2, where they receive the head, neck, arm and chest exercises, but no leg exercises. The acute cases remain in platoon 2 on an average of three weeks, and the acute exacerbations of chronic conditions remain there from two to three weeks. Chronic cases reporting for examination and treatment are placed in platoon 2 when they are not responding well to their respective treatments and there is danger of complications. They remain in this platoon approximately three weeks. In platoon 3 the patients receive the head, neck, arm and chest exercises and half the leg exercises. The acute cases remain in this platoon about three weeks, the acute exacerbations and the chronic cases three weeks. Platoon 4 is the graduating class, each case receiving at least two weeks of full duty before being discharged from this department. Both the acute cases and the acute exacerbations pass through all four platoons. The chronic cases are placed in whatever platoon the examining officer or prescribing officer decides to put them. As the soldier's condition progresses the officer in charge of the prescribing room sees that he is

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changed from one platoon to another. The necessary changes are made on the soldier's history and a note is sent both to the soldier's commanding officer and surgeon notifying them of the change. Those cases receiving treatment in this department are confined to quarters, following such treatment, until reveille the next morning. By use of the platoon system and rest following treatment we have been able to avoid a large number of complications. For the past four months we have been treating all acute cases in this department, sending only the acute complications to the base hospital. The results have been satisfactory and complications have not increased.

Histories left by patients on the desk at exit B are collected by an orderly and taken to the history room 3. The histories are filed away according to companies and days these companies return for treatment. A card is then made out duplicating the history, and is filed in a similar way in our index card file. A triplicate of Form 9 is made out by a clerk in the history room, the original is detached from the duplicate, the duplicate is filed away with the soldier's history and the original with the triplicate are delivered both to the soldier's commanding officer and surgeon by an orderly from this department.

When a case reporting here for examination is found to have no evidence of venereal disease, the laboratory report, with the duplicate Form 9, is filed away in our "no evidence" file. The original, with the triplicate, as in the other case are delivered to the proper authorities.

Patients report to this department for their treatment between the hours of 8 and 11.45 a. m. They report as companies in charge of an officer who has with him a list of all the men from his company that are supposed to report that morning for treatment. If any are sick in quarters or the base hospital, this is noted across from the patient's name on the list. The soldiers enter the building by entrance A, turn to their left, go down the corridor until they come to entrance X, where they enter and take seats on the benches. The officer in charge then takes the list of names to room 3, where he hands it over to the noncommissioned officer in charge of that room. The noncommissioned officer picks out the histories of that company for that day's treatment, noting any that are sick in the base hospital or quarters on the top of their histories which remain in the file. The histories are then taken from room 3 by a clerk, who stands back of the railing at exit Y and calls out the names of the soldiers, who, as they pass, receive their histories and file down the hall to room 7, where they remain in line. As soon as one company leaves the waiting room another company files in. It takes about fifteen minutes per company. The patients with history in hand enter room 7, their pants are lowered to

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their knees and their shirts pulled up above the waist line, and as they pass by the examining officer their urethral discharge is noted together with the condition of the first and second urine, which is checked off on the prescribing sheet placed on the front ofeach patient's history before entering room 7. If it is necessary to wait for a report on a patient's urethral smear, he is placed in the retention pen until the slip is returned. From here the patients pass into room 8 and file before the prescribing officer with their clothes down. He examines the penis, inguinal region and the contents of the scrotum. Before prescribing for a patient for that day he first looks over the treatment sheet on the second page of the history, which gives the condition of the patient's urethral discharge and urines for several weeks back; also the treatment he has received; then at the diagnosis sheet, then the complication sheet, where all abnormalities are noted, and finally examines the prescribing sheet where he can note the condition of the discharge and urine, and the treatment is given accordingly. Proper checks are made on the prescribing slips and the rooms the patients are to report to for their treatment. Any obscure cases passing by the prescribing officer or any complications are placed in the retention pen, where they remain until the crowd has filed by. They are then taken up and a careful examination is made of each case. If it happens to be an acute complication, two copies of Form 8 are made out by the clerk, giving the patient's name, organization, original diagnosis, additional diagnosis and disposition to be made of the case. Then Form 10 is made out, which accompanies the patient to the base hospital. The ambulance is summoned and ambulance driver is given the original of Form 8 and Form 10 which he delivers with the patient to the organization surgeon. The surgeon makes out an informal transfer, sends the patient to the base hospital with this informal transfer and Form 10. Form 8 is kept on file for the surgeon's information. The triplicate of Form 8 is sent that evening by an orderly to the patient's company commander informing him of the disposition made of the case. On the progress sheet of the patient's history is noted the complication, and on the front page that this patient has been sent to the base hospital. His history is then kept in the base hospital file until he returns for active treatment.

Acute cases report daily for their treatment; chronic cases not oftener than twice a week. After leaving room 8 the acute cases report to room 16, where they receive anterior irrigations. The treatment is initialed by the officer in charge of the room. If internal medication has been prescribed for that day, the patients next report to room 4, where they receive their pills. This is also initialed. They then leave the

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building by exit B, but before this their treatment slip is examined by a guard, who sees that all treatments prescribed have been properly initialed before he allows the patient to leave the building. It might be mentioned here that both the entrance and exit to these buildings are guarded at all times, so it is impossible for a patient to leave before receiving his proper treatment.

We will next take a chronic case, one, for example, on this day receiving silver and massage. After leaving room 8, the patient reports to room 17, where the prostate and vesicles are massaged and smears collected. He then goes to room 16 where an anterior irrigation is given, and from there he reports to room 10 and receives his posterior silver; thence to room 4 for his drugs, and leaving the building by exit B. A patient for silver and sound, after leaving room 8, reports to room 16 for anterior irrigation, then to room 11 for his posterior silver and from there to room 6 for the sound. Finally he goes to room 4 for his medicine, leaving the building by exit B. The histories of these patients reporting for treatment are not replaced in the files until a note has been made of those cases failing to report for treatment. Each day that a patient fails to report for treatment a note is sent both to his organization surgeon and commander informing them that such and such a soldier failed to report this day for treatment.

REMEMBER THE OCTOBER MEETING AT ST. LOUIS MISSOURI, FROM THE 13th to 15th OF THE MONTH

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PRESENT SURGICAL PROBLEMS IN UNITED STATES ARMY HOSPITALS

By Lieutenant Colonel H. WINNETT ORR
Medical Corps, United States Army

AS CONSULTANT in orthopedic surgery, the writer was attached, from August, 1918, to February, 1919, to the Savenay Hospital Center. Until November, all the sick and wounded en route to the United States were sent through this center, and all of those who had suffered battle casualties were examined, treated and checked out to the United States by the surgical and orthopedic services working together. In this way practically every battle casualty which occurred in the American Expeditionary Forces, sent home prior to December 1, except those which came through England, was observed at the Hospital Center at Savenay. Many of the patients were seen twice, inasmuch as the orthopedic consultation area embraced other hospitals in Base Section No. 1, and the treatment was, to a certain extent, under the influence of the consultant in orthopedic surgery before the patients were seen for the last time at Savenay on the way home. From August to January approximately 15,000 patients classified as orthopedic were seen in this way. This included all fractures, all other bone and joint injuries, all contracture deformities existing or impending, due to soft part wounds, spine and sacroiliac injuries and inflammation, static and traumatic foot and leg conditions, etc.

The patients of greatest interest from the standpoint of treatment, as well as from the standpoint of transportation, were the battle injuries, involving damage to bones and joints. A large number of these also had injuries to principal motor nerves, with consequent paralysis and disability or deformity.

In November, to facilitate the work of our own hospital center, a circular was prepared, showing the incidence of each class of cases per one thousand patients and suggesting certain measures that had proved more satisfactory than others, for dealing with these conditions. The figures in this circular and the recommendations made were based upon an experience up to that time of approximately 6,000 cases seen at Savenay, and also upon an experience of fourteen months in the war surgery of late cases in one of the orthopedic centers in Great Britain. It is upon this and four months' further experience at Savenay in observing conditions as they presented themselves there and as they departed for the United States that the following suggestions are made.

In a general way it may be stated that the late stages of battle

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casualties which do not recover at once may be classified into the following groups:

1. Soft part wounds involving only muscles or tendons in which healing occurs with no other bad effect than limitation of motion.

Under this head a very considerable number of patients presented themselves at Savenay with gunshot wounds and other injuries of the soft parts, who had been carefully splinted and protected against contracture deformity. In a few instances, in which there were posterior thigh or calf wounds, there was practically no knee joint or ankle joint movement. This was, of course, because the patient found it painful to reëstablish motion in parts in which there was considerable scar involvement. In most of these cases careful massage and graduated exercises were sufficient to restore a large share of the lost or impaired function. There are in the army hospitals, at the present time, a great many such cases. In this class of cases practically all that is necessary is careful prescription by the surgeon to the physio-therapeutic reconstruction aides, whose treatments are of the greatest value in these as well as in other classes of cases.

In a certain number of cases much time can be saved and better results obtained by establishing motion for the affected part by manipulation under anesthetic. In such cases it is usually wise to keep the parts in plaster of Paris or in a proper splint for from three to five days, especially if there is much scar. After that time fairly active efforts must be made by massage and passive or active motion to preserve all of the gain in motion accomplished by the manipulation. This is particularly true in the case of stiff hands and fingers following gunshot wounds of the forearm and wrist. In this connection, use must be made also of the flexion and traction finger splints, which are very helpful in restoring motion even after stiffness has existed for a long time. Two of the best of these splints were devised by Baldwin, who was with the British in Edinburgh, and Lewis, who was on duty with the British at Liverpool. In all forearm and hand cases it is of the greatest importance that the hand shall be maintained in complete dorsal flexion. A mistake has been frequently made in keeping fingers in extension too long, and care must be taken in splinting the forearm not to carry it to the point of allowing too great an amount of stiffness to occur.

2. Wounds of the same sort in which healing occurs with fixed malposition of the affected part.

In this class the problem is quite a different one. A fairly large number of patients presented themselves at Savenay with flesh wounds of the thigh, which had been permitted to heal with the knee in flexion,

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or of the leg with the foot in equinus. All of these cases were forcibly corrected under anesthetic and put in suitable splints or plaster of Paris before being sent to the United States. It is known, however, that a certain number of these casts and splints were removed for sufficient reason, and that a large number of others were removed by patients themselves, so that the patients have arrived in hospitals in this country with these and other similar deformities existing. One of the most striking of these conditions is that in which there was a flesh wound of the side of the chest or in the axilla in which the aeroplane splint had been applied. It was this splint especially which the patient was prone to remove, as it was cumbersome to wear and the patient was much more comfortable, especially at first, without it. It is obvious that all such deformities must be corrected either by stretching of the contracted parts or by plastic surgical methods.

The space of this paper will not permit a detailed discussion of the numerous procedures involved. In dealing with patients of this sort in Great Britain, however, it was found feasible to excise very large scars in the thigh, leg or arm and, by rather simple plastic procedures, restore extremities to normal position. It goes without saying that the most careful splinting is absolutely essential as a part of the post-operative treatment in all of these conditions. If these contracture deformities, however, are seen within two or three months, they will usually yield to one stretching procedure or to several repeated stretchings under gas anesthetic. Plaster of Paris has been found by far the most satisfactory splint for these conditions because of the fact that perfect immobilization for the few days following is the best protection against the lighting up of inflammatory processes in these late scar areas. It has frequently been observed that the irritation which results from the imperfect fixation of these conditions after manipulation, or after operation, is often followed by an inflammatory or suppurative process.

3. Fractures in which union fails to occur.

Ununited fractures at the stage at which they will be found in the army hospitals in this country will practically always require surgical treatment. The kind of surgical treatment to be provided is still, unfortunately, a matter of some discussion. It may perhaps be granted that there are some operators who will succeed better with methods that in general use have failed to give satisfactory results. As a general proposition, however, it can be laid down that the autogenous bone graft, properly used, has given by far a larger number of successful results than any other procedure. In the hands of many operators a metal plate is a source of danger, and most of the elaborate plastic

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bone operations that have been suggested and used involve too much traumatism and too much time to be perfectly safe in the hands of all operators. It might be well for a standard procedure to be adopted, or at least endorsed, for the army hospitals as a step in the direction of standardizing such treatment for the surgical profession at large. In those cases especially of the femur and leg, where there has been extensive loss of bone substance (from 1 to 3 inches), it is of the greatest importance that, during the entire time of wound treatment and healing, full length of the extremity shall be maintained and the question of bone repair deferred until surgical implantation of bone can be done. This must, of course, wait until the soft parts are soundly healed and free from the danger of re-infection as a result of the surgical procedure. In these cases also post-operative splinting, preferably by means of plaster of Paris, must provide practically perfect position and immobilization if prompt and satisfactory healing and union are to be obtained.

4. Fractures where mal-union or shortening occurs, or both.

The patients under this heading furnished by far the largest number of cases requiring surgical treatment at Savenay. Practically all of the patients with femur and leg fractures presented themselves at Savenay with some shortening. Moreover, a considerable percentage had already secured union. In fractures of the femur, it was the rule that patients with mal-union of the femur and shortening in excess of 1 inch should have the benefit of an attempt to readjust the fragments and to secure additional length. For a very considerable number of such patients, lengthening of from 1 to 2½ inches was secured. During August and September, at Savenay a series of 300 femur cases of all kinds was measured on admission, and they were found to have an average of 5 cm. shortening. From August to February, about 2,500 fractured femurs were received at Savenay and, while data of all cases are not available, the average amount of shortening may be said to have been approximately the same as in those which were carefully measured. The average shortening in patients sent to the United States, with or without union of the femur, was less than 1 inch. This included many patients who had firm union with shortening in excess of 2 inches.

In general, the same rules should apply here. Patients with mal-union of the femur which has existed less than six weeks and with shortening in excess of one inch can usually be revised without open operation and additional length secured for them. This involves a manipulation under anesthetic and perfect post-operative splinting. The method of splinting is approximately as follows:

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Gunshot Wounds and Other Fractures of the Hip[1] (10 cases per 1,000).—Early and adequate splinting of gunshot fractures of the hip has yielded some of the most brilliant results in the treatment of war conditions. The mortality has been greatly reduced for both transportation and treatment in base hospitals. No other single factor has contributed so much as the Thomas thigh traction splint. It is unfortunately true that the efficiency of the splinting has not always been maintained between the front lines and the hospitals farther back. The Thomas splint should be applied and cared for always in the same manner. The introduction of individual methods invariably leads to a loss of efficiency, as patients pass from the hands of one surgeon or hospital to another. The following points must be observed. A long splint and a well-fitting ring must be selected. It must be bent to an angle of 10 to 15 degrees at a point 1½ inches above the level of the knee joint. Having regard for wounds, the adhesive traction bands (of Sinclair glue or moleskin plaster) must include as much skin of the leg and thigh and extend as high as possible. The traction ropes for twisting, attached to the lower end of the adhesive, should be of ¼-inch rope or of 4-ply muslin, fastened very securely into the adhesive, so that it will not give under a pull of even 15 to 20 pounds. Muslin hammocks of not more than 4 inches in width should be placed across the splint for its entire length at a sufficient tension, so that the leg rides well on the top of the splint. The splint is then put on and the traction straps tied firmly over the lower end with the ring tight against the tuberosity of the ischium. A right-angle foot-piece is put on, and the foot and knee bandaged in such a way as to put the entire extremity at rest in the splint. The twisting of the traction bands should have attention once or twice daily. The lower end of the splint should be tied to the outer end of the foot of the bed in such a position that the lower end of the femur rotates slightly outward. The foot of the bed should be raised 12 inches so that the patient's body acts as a counterweight to pull against the anchored splint. By following exactly this technique it has been possible at Savenay to demonstrate an average gain in length of more than 3 cm. in a series of over 300 cases. In dealing with open wounds in this splint it is only necessary to release one or two of the 4-inch hammocks. Care must be taken so that the entire area of the fracture is not moved or allowed to sag below the level of the anterior curve of the femur.[2] In fractures of the neck, good traction and slight abduction having been maintained in the meantime, a plaster of Paris spica with full abduction should be applied as soon as possible. The Thomas double abduction splint should not be used except by those with experience in the use of this particular device. In complete destruction of the neck with loss of substance, early excision of the head through a posterior incision is advised. Following the operation also, as soon as the wound permits, a plaster spica with full abduction should be used. Departure from the principles enunciated above for special purposes should seldom be made; lowering of the foot of the bed or raising of the head are only justifiable under exceptional circumstances.

Gunshot Wounds and Other Fractures of the Femur (75 cases per 1,000).—All of the remarks just above with reference to the application of the Thomas splint apply to fractures of the shaft. An astonishingly large number of femur fractures of the shaft, apparently well splinted at the front, arrive at the end of six to twelve weeks with from 1 to 3 inches of shortening. A large amount of this must be charged to failure to make efficient use of the Thomas splint. This splint either with or without overhead suspension in the Balkan frame must be considered to have proven by far the best method of treatment.

[1] Quoted from Memo. No. 178, Headquarters Savenay Hospital Center, November 26, 191

[2] In doing surgical dressing, especially.

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5. Joint injuries in which ankylosis occurs with bad position.

Joint injuries, in which ankylosis occurs with the extremity in good position, may be counted as satisfactory. Attempts to mobilize such joints, except by very late plastic procedures, practically never give good results; usually, in fact, they lead to trouble or disaster. In cases of joint injury with ankylosis in bad position, the attempt to restore the extremity to a position of usefulness is usually justifiable. If this is done early, the risk is not great. A quotation from our experience at Savenay will not be amiss in this connection. A very large number of patients came to us, either directly from the front or by the way of one or more intervening base hospitals, still wearing, after gunshot wounds of the elbow and upper arm, the straight Thomas arm splint with the arm in full extension, the hand pronated and traction applied to hand and forearm. The rule was made in August that all such arms should be taken out of their straight splints and elbows flexed and the hand supinated. At Savenay this rule was followed implicitly; no exceptions were made. To anyone familiar with battle wounds of the elbow and upper arm and who appreciates that these arms came to Savenay in all stages from three or four days after injury to fourteen weeks, it will be obvious that some of the corrective procedures applied were not undertaken without hesitation. Many hundreds of these procedures applied were done, however, and it seems a sufficient commentary upon the amount of risk involved to say that there was not a single case of this sort at Savenay where subsequent amputation of the arm was required. That hundreds of these were rescued from uselessness and made good functional arms is certain. One of the first patients seen by the writer upon his return to the United States was a conductor on a New York street car, who was back on his old job doing full duty on full pay with an arm in which this procedure had been done, following a gunshot wound of the elbow.

Ankylosis in bad position of the wrist, hand and finger joints may be an indication for much more extensive surgery than in other regions or joints. Amputation, even of two or three fingers if they have become useless, is justifiable if it restores usefulness to the ones that are left. Pseudarthrosis in the metacarpus may be used as a resort if the metacarpo phalangeal joints have been entirely lost and preservation of motion even in a single finger is useful. In severe infection, very extensive drainage of forearm, wrist and hand has been found in many cases to give a very gratifying amount of function, in what appeared to be a hopelessly damaged arm and hand.

6. Nerve injuries in which there is paralysis, but in which good position of the parts has been maintained.

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In the British orthopedic hospitals much attention has been given to the re-suture of divided nerves. This subject has already been pretty thoroughly covered in the recent literature. It is perhaps only necessary to say that, both before and after re-suture of such nerves, the parts must be maintained in such position that paralyzed muscles or muscle groups are carefully protected against overstretching and that careful re-suture of the nerves under such surgical conditions as are already well known will be followed in a certain percentage of cases by regeneration and partial or complete recovery. Those cases in which there has been re-suture of musculo spiral, sciatic, ulnar, median, external popliteal nerves show that regeneration of the nerve occurs in percentages of cases varying from ten to forty. If the extremities involved have been adequately splinted and the muscle tone has been maintained by massage, electrical treatment, etc., return of function when it once begins is rapid and very gratifying. In the cases in which return of nerve function fails to occur, the various procedures of tendon fixation and tendon transfer must be considered. These are similar to those already fully described in the literature for the conditions that follow infantile paralysis. One of the most useful that is now being regularly employed in military reconstruction hospitals is suspension of the foot by the Gallie or Jones method. In permanent loss of the musculo spiral nerve one may use transfer of the wrist flexors and the palmaris longus to the extensors of the hand, fingers, and thumb. Transfer of the hamstring tendons to the quadriceps and the combination of arthrodesis and tendon fixation (the Whitman operation) for certain cases of extensive nerve damage in the lower extremity are also recommended.

7. Nerve injuries with paralysis in which there is contracture of the unparalyzed muscles and in which there is deformity as well as disability.

The patients who come under the classification, however, present a different problem. Many hundreds of them came to Savenay with drop foot following injury of the sciatic nerve of the external popliteal, or even with the foot in firmly fixed equinus, so that forcible correction under anesthetic was necessary. The same was true of drop wrist following injuries to the musculo spiral. Surgical procedure for the repair of nerves in such extremities is idle unless the deformity is corrected and practically a normal range of motion established beforehand. These conditions, too, must be splinted, following operation, with the greatest care and careful massage and mechanical treatment provided throughout the whole post-operative course of six months to two years, or ultimate regeneration of the nerve will fail of its purpose and the operation be of no effect. Normal position and, as nearly as possible,

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normal range of motion must be provided for every extremity in which any hope of result from a re-sutured divided nerve is entertained.

The various procedures of tendon transference, tendon fixation, arthrodesis, etc., discussed fully under No. 7, are even more often necessary in this class of cases. In addition, the removal of bone and other more extensive procedures may be necessary in the wrist and ankle for correction of deformity and reëstablishment of some function if severe contracture deformity has been permitted to exist for a very long time. Occasional cases have been seen in which, in the case of badly contracted feet, in heavy individuals, amputation has been deemed expedient so that such patients could be made ambulatory again without too long hospital residence and repeated surgical operations. One point to bear in mind also is that very extensive surgery of the forearm and hand, with even slight improvement, is to be preferred to amputation of the upper extremity.

8. Those amputation cases in which no artificial extremity has been applied, or in which for some reason inside the stump a satisfactory artificial appliance cannot be worn.

On account of the tremendous amputation problem which the British had to face, a great many of their amputes were sent home during 1916 and 1917 as soon as their stumps were healed. These men were not discharged from the army, but sent home on furlough to await an opportunity in the orthopedic and limb-fitting centers for stump treatment and the application of artificial extremities. The interval between being sent home and being recalled ranged from two or three months to a year. In the orthopedic center with which the writer was connected, about 500 of these patients were seen as they came back for the application of artificial limbs. A great many of them were found to require further surgical treatment before limbs could be applied. They presented flexion stump deformities, enlarged and painful nerve bulbs, tender and painful scars on the ends of the stumps, some discharging sinuses, and in a few instances retained pieces of shrapnel or bullets which had not been removed. A few patients required re-amputation. In all, for approximately 500 cases about 300 surgical procedures were necessary. With the Americans this problem will be simpler because the needs of this class of cases were recognized early and the total number requiring care was comparatively small. A considerable percentage of the patients was fitted with provisional limbs before being sent to the United States. We have, therefore, comparatively few contracture deformities and shall have very few tender scars or painful stumps from any cause. We shall have some cases, however, which failed to heal, and a few requiring re-ampu-

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tation and removal of painful nerve bulbs. Early repeated operations upon amputated stumps are to be discouraged. They make for osteomyelitis and shorter stumps on the average. The more conservative methods, simple operations and treatment by stump traction are to be urged. Scars are not serious, even if tender, if artificial extremities can be provided in which weight bearing is taken off the end of the stumps. Early, careful use of provisional limbs, careful stump exercises in gymnasium classes, massage, etc., will eventually prepare many stumps for limb wearing upon which earlier surgery might have been deemed advisable. Various forms of artificial limbs and frequent fitting may be necessary to enable the patient to begin walking. In double amputations a useful suggestion from the British is the employment of very short pylons which are gradually lengthened as the patient learns to walk; this plan has already been introduced in this country and is working splendidly. The possibilities of plastic surgery for stumps and the application of certain special appliances along the lines of kinematic prothesis is a question which is still open for discussion.

All of the problems of post-operative massage, occupational therapeutics, electro-therapeutics and reëducation must receive careful consideration. They must all be employed to a very considerable extent. Not only has their value been demonstrated by the other allied nations, but their worth has already been proved in the American hospitals in France. Altogether the United States army reconstruction hospitals are splendidly organized and well equipped for the task. It is only necessary to recognize in detail, leaving nothing out, exactly what the problem is which must be met and which must be solved.

REMEMBER THE ANNUAL MEETING IN ST. LOUIS, MISSOURI, FROM OCTOBER 13th to 15th.

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HISTORY OF MEASLES AT CAMP ZACHARY TAYLOR, KENTUCKY, SUMMER OF 1917 TO WINTER OF 1919

By Major HERBERT FOX, M. C.

Base Hospital Camp, Zachary Taylor, Ky.

(With one illustration)

This is the first of a series of selections from definitive contributions to the Medical History of the War which will be printed from time to time in The Military Surgeon. These publications will be selected from the great mass of historical material, with an eye to their extrinsic importance and value to medical officers of the services.—*Editor.*

INTRODUCTION

THE appearance of measles in an army camp is slightly different from epidemics among the civil population. In the latter case the disease appears and spreads chiefly among the young, despite efforts to stay it, and, as is well known, it attacks the adult less often. In an army camp, on the other hand, the conditions of barrack life supply almost ideal surroundings for dissemination of the virus, since crowding is like adding fuel to a fire, the blaze advancing until inflammable material is burned out, whereas in civil communities only small units, easily isolated, are exposed. History has indicated that army camps have practically always some outbreak of measles, and this has been found to be due in part to the above-mentioned condition and in part to the collection of a large number of non-immunes in armies. There is sufficient information at hand to indicate that the urban population of the world is exposed to measles early and passes through it with a relatively low mortality, thus leaving a high percentage of immunes. The rural population, on the other hand, shows a lower percentage of measles in youth, so that the proportion of immunes among adults is low. Soldiers from rural districts therefore supply the inflammable material, particularly for measles. It has been said that measles is a mild disease in children and a severe one in adults. Such, indeed, seems to have been the case at this camp, but in making such a statment due consideration must be given to the concomitant presence of pneumococcus and streptococcus infections during the first year of the camp's existence.[1]

1 Hamburger and Fox. No. American Clinics. September, 1918.

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HISTORY OF THE CAMP

Camp Zachary Taylor is situated 5 miles southeast of the city of Louisville, Ky., in a relatively flat, loam and clay country. The territory was occupied by grain and truck farms and had been highly cultivated for a long while. This implies, of course, that there was considerable organic matter to be distributed by winds, and during the early months of the camp, before the soil had been battened down, dust storms were very annoying and probably had some effect during the early months in aggravating the outbreak of inflammations of the upper air passages. The camp was opened in August, 1917, by the 1st Kentucky Infantry, later the 138th United States Infantry, an organization made up chiefly of men from urban districts and little affected by the disease. At the end of the month the Camp Headquarters Personnel reported and made ready for the first draft, which appeared on the 5th and 6th of September. The accompanying chart will sufficiently illustrate the numerical strength of the drafts as they appeared, and their number will not be repeated here. Those which arrived during the first two months were received in excellent weather, whilst during the severe season, December, January, and February, relatively few men were inducted into service. These men came from Kentucky, Indiana, and southern Illinois. The sections of the country from which they came shows a relation of two-thirds rural and one-third urban, but an analysis of the distribution sheet shows the proportion to be rather more in favor of the rural origin of these men. Of the 42,000 men assigned to this camp in the first draft, 9,600, or 23 per cent, were from urban communities, thus supplying more than three men in four from the area in which it is believed less measles occurs during childhood and consequently less immunity exists in adult life. During this period there were practically no colored troops; negroes only started to appear in considerable numbers in December, 1918, and played no part in the measles incidence.

An attempt was made to keep men from one locality in the same organization, and in one or two regiments this was possible for some time, but the exigencies of the service, the appearance of epidemic disease and, most of all, the demand for transfers to other camps, made it impossible to continue this policy, so that the 84th Division rapidly became a thoroughly mixed group from all sections of this region. Men were at first retained in the Depot Brigade for a period of two weeks to permit of their classification and to weed out communicable disease; this was later extended to three weeks.

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An analysis of the disease chart of the sanitary inspector of this camp shows, very clearly, high incidence of communicable disease in the Depot Brigade during October, November, and December, 1917, its reduction here and appearance in organizations as men were distributed from this receiving station. In the spring of 1918 transfers became very frequent, and removals from the Depot Brigade occurred promptly after the three weeks' observation period. The sanitary inspector's report shows clearly that measles appeared in organizations in proportion to the number of newly inducted men and inversely in proportion to their length of service; that is, if a transfer of a large number of men who had been in the service but three weeks were made to an organization, the measles would increase in proportion to this new increment. This organization would burn itself out of inflammable material only to increase again in measles upon reappearance of a new quota.

THE CAMP MEASURES AGAINST MEASLES

It is impossible to say whence or how measles came into the camp, but sufficient opportunity existed despite inspections, if from no other source than the city of Louisville, since the connection between it and the camp is very close. At the time of the beginning of the camp it was the object of the medical examiners to exclude from the barracks and put into the hospital anybody suspected of a communicable disease, but of course it was impossible to detect all of them in their incubation period. Later on the spread of all communicable disease was limited in the camp by daily medical examination and a practical abolition of the old-fashioned sick call, that process by which it is up to the soldier to say when he is sick. Major Hamburger showed conclusively that the sick call kept a great many soldiers out of hospital when they should have been receiving treatment and when they were infective.

As was said above, it is impossible to separate the measles and the streptococcus infections, not because they were not separate entities but because they modified each other. The hospital at this camp realized in November, 1917, that there was to be dealt with a highly virulent streptococcus, and instituted measures toward disinfecting the nasopharynx of all persons admitted; results were, however, not forthcoming and the procedures discontinued. During the winter studies were made as to the distribution of the streptococcus in the camp and in the hospital, and the conclusion was arrived at that a protection against a streptococcus carrier state was a highly important thing, particularly in measles, but also in

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other conditions. Propositions were made to camp authorities to separate streptococcus carriers and non-carriers. This proved impracticable from a military standpoint, so that in the spring a proposition was made to swab the incoming drafts in order to weed out carriers. This was practicable enough, but, unfortunately, they could not be sufficiently segregated because of the absence of small detention units. Carriers were, however, isolated in the hospital area.

One of the questions which confronted medical officers in the study of measles was the practicability of preventing it and as to whether it were not better for soldiers to have measles here than in the trenches in France. Despite discussions in which many took the affirmative of the last and a rather pessimistic view, it was decided that no effort should be omitted that would tend to reduce the number of cases in camp. It is said that no patient died of measles; the mortality was, however, very high, by reason of streptococci and pneumococci, a sufficient reason to fight the disease. We felt, however, that if measles were inevitable they should be detected and brought to hospital as early as possible. It was upon this decision that the measures outlined later were adopted and enforced. It was recommended at this time that a vigorous and comprehensive detention system be established in the Depot Brigade and that a similar detention should be arranged for outgoing troops. It was felt that the unusual conditions the drafted men met when they came into the camp reduced their resistance materially, and it was recommended in that direction that a very mild schedule be made up for the detention period in order that the men might become acclimated.

COURSE OF MEASLES CASES AND RELATED CLINICAL AND PATHOLOGICAL NOTES

(See Chart)

The course of measles in Camp Taylor is graphically presented on the accompanying chart, which was prepared, not from the daily communicable disease list, but from the finished clinical records of the Sick and Wounded Office at this hospital.

The solid line represents the aggregate number of cases per weekly period, the black blocks the aggregate deaths per week, the open columns at the top of the lowest curve represent the drafts, the dash lines the average aggregate strength for the week. The upper charts are made on the same basis. It is to be noted that

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the dash line rises abruptly from the base on September 30, 1917. This is due to the fact that on this date is the first obtainable aggregate strength report of the camp, which represents practically only draft men of the National Army. Beginning August 18, 1918, two strength lines are noted; this is where the strength report of Camp Knox is separable from that of Camp Taylor. Camp Knox is practically under the command of Camp Taylor, and we received from them a considerable number of patients until their camp hospital was under way in December, 1918. They had very few measles cases, and they are included in this series.

The first period of measles, that of October, November, and December, 1917, stands in direct relationship to the September and October drafts. This represents roughly 970 cases, of which 8 per cent had pneumonia with a mortality of 19 per cent, and of which 26 had empyema showing a mortality of 25 per cent. This epidemic was moderately severe. The cases that developed pneumonia were noteworthy in their clinical appearance upon admission; when seen they showed a flushed face, cyanosis, labored grunting respiration, a full pulse and marked prostration. The pneumonia of this period was usually of a scattered catarrhal type. At autopsy the lungs were expanded and heavy, and the surface nodular from innumerable small, firm areas generally distributed, which on section appear as light, red-gray, firm patches like gray miliary tubercles. Later on, and especially in those cases that lived several days, the nodules were larger, somewhat more diffuse and gray.

January and February saw a decline of measles, and it was not until the draft of late February that additional fuel was added so that the second period of measles of March, April, and May appeared. This was a distinctly more severe epidemic and was complicated by the increased virulence and pathogenicity of the streptococcus. The patients were notably sicker upon admission and, when they developed pneumonia or streptococcus sepsis, failed to respond to any treatment. There were in this group 414 cases, of which 54, or 13 per cent, developed pneumonia, and of these 37 per cent died. Of the 54 cases of pneumonia 15 developed empyema and 2 died. During this epidemic 3.6 per cent of the total number developed empyema, whereas in the first period only 1.8 per cent developed it. The mortality was lower in this period, 13 per cent as compared with 25 per cent, possibly due to improved methods of treatment. The pneumonia at this time was similar in some cases to that of the first period, but the evidence of the streptococcus

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was more pronounced, there being frequently generalized serositis and a very decided hemorrhagic pneumonitis.

During May, June, and July there was a low measles rate, about 400 cases in all for these months, with only 2½ per cent of pneumonia and but one death. Empyema at this period was also relatively low and present in the above-mentioned death. The case incidence for this period is relatively high for summer because at that time improved hygienic conditions, milder weather and exercise should reduce it. Attention is called, however, to the large drafts from April to the end of July and the rising aggregate strength of the camp.

During the latter part of July, August, and early September there is maintained a fairly high measles rate, but it is noteworthy that during this time pneumonia following this disease is relatively low, there being but one case recorded. Other complications in the form of otitis, erysipelas, and severe bronchitis are recorded, but they seemed to have no influence on the mortality.

The great influence of the large number of non-immunes of the summer draft was shown in the epidemic of measles in September, October, and November, during which calendar months 865 cases of measles and 46 deaths occurred. In this connection it must not be forgotten that we were at that time in the throes of the influenza epidemic and that the latter may have had an influence upon the morbidity and complication of measles. Chronologically the measles epidemic antedates the outbreak of influenza by two weeks; they rose in a similar manner—that is, rapidly to a sharp peak—but it required five weeks for measles to reach its maximum admissions, whereas it required but one week for influenza to get in full blast. Measles continued at a high weekly incidence, September 22 to October 27, whereas on October 19 the influenza epidemic was practically over. The mortality differed very decidedly. By consultation with the chart it will be seen that the mortality in the first four weeks of the epidemic is greater than at any other time for this disease and it began at the time of the marked initial rise in case incidence. On the other hand, influenza mortality began six days after the cases and did not reach its height until ten days after the height of the epidemic. The mortality of measles fell off and was lower during the high incidence, whereas influenza mortality rose even after the incidence of this disease had been cut in half. It seems probable, therefore, that there is little influence of one disease upon the other so far as the complicating mortality

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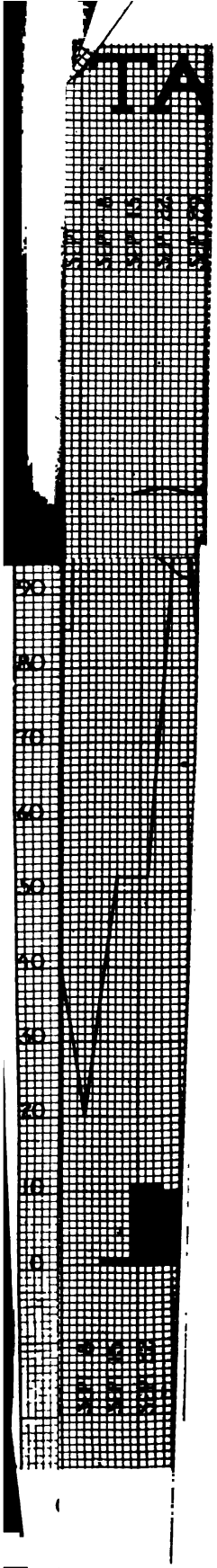

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is concerned. The case and death rate for measles-pneumonia are as follows: There were 118 cases of pneumonitis, 13.6 per cent, and of these 42 died, a measles mortality of 4.8 per cent, and a pneumonia mortality of 35.6 per cent; 16 cases of pleuritis occurred, or 1.8 per cent of the measles, with a mortality of 6, or about 0.7 per cent mortality for measles, or 36 per cent mortality for empyema. The four deaths unaccounted for by pneumonia were due to meningitis and mastoiditis. There are no cases classified as primary pleuritis during this epidemic.

The clinical appearance of these measles cases on admission was one of only moderate severity but with a rapidly blooming rash. The early cases quickly became worse with a result as indicated in the death column. The cases of the second and third week were notably less sick and with a very distinct decrease in the cyanosis. In the cases developing empyema it did not appear so rapidly nor so stormily as was the case in the spring epidemic in 1918, and a diagnosis of pneumonia could be made before the appearance of empyema in practically every case; there did not seem to be any primary pleuritis. The picture of septicemia and multiple serositis did not reappear. The mortality from pleuritis is lower than in the spring outbreak, about 0.9 per cent for the fall as against 3.6 for the spring; the early cases died rapidly from pneumonia before empyema had time to develop. This is another evidence of the fact that pneumonia *per se* was a more important factor than pleuritis.

The pathology in this period deserves the following note: 25 of the 46 deaths were posted, 24 of them showing bronchopneumonia and 1 a croupous lobar pneumonia. In the first half of the epidemic the lesions were rather definitely peribronchial and of the type described as "like miliary tubercles," while in the latter half they were more disseminated in lobular distribution and more hemorrhagic. It is noteworthy that there was not the extensive serous membrane inflammation or the evidence of streptococcus septicemia so marked in the spring epidemic. Seven times a dry pleurisy was found and nine times a sero-fibrinous or purulent. The involvement of the sinuses of the head was rather noteworthy and nine cases presented a purulent otitis media. Naturally enough there was found some pathology in the meninges and brain; congestion, opacity, edema or lepto-meningitis, but no case of epidemic meningitis was encountered among the measles.

Infections of the ear were present in 29 cases during the epidemic of the fall of 1917, 3 per cent of the total. Of these 29, 3

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died. In the spring epidemic there were 20 cases, or 5 per cent, of which cases 2 died. During the fall epidemic there were 105 cases, or 12 per cent, and of these cases 9 died. Of the 9, however, only 1 case of measles died from an otherwise uncomplicated condition; that is, only 1 of the 9 died of otitis media and mastoid septicemia and did not have a pneumonia, pleuritis, or other condition.

There have always been a few cases of erysipelas or erysipeloid complications after mastoid throughout the history of the camp, but true erysipelas began very early and has maintained an incidence of two or three a week almost constantly. In the fall of 1917 two cases with this disease died, but they were complicated with other conditions. Since then, none of the cases of erysipelas have occurred in fatally ending illnesses. There have been a total of 19 erysipelas cases among the measles in this camp.

BACTERIOLOGY

During the fall of 1917 the bacteriological factor in inflammation of the lungs, whether it be primary or concomitant with measles, was a pneumococcus, the streptococcus at that time attacking chiefly the pharynx and related structures. The streptococcus continued to rise in frequency during the winter while the pneumococcus declined in importance, so that in the spring outbreak the former was the dominant microbic agent. During the spring we had numerous cases of primary pneumonia with streptococcus septicemia and serositis and indeed some serositis and septicemia without involvement of the lung primarily. During the summer pneumonia, which was independent of measles, pneumococcus again became the important factor. This decreased, and the streptococcus again resumed sway, it being very important during the measles-influenza period, although in nearly all cases there was a very decidedly mixed flora in the respiratory tract. (See below.)

The pneumococcus has been predominantly Type IV in this camp through all its history. The sputum typings of sufficient accuracy to record show the following distribution:

	No.	*Per cent*
Type I	98	11.2
Type II	73	8.3
Type IIa	26	2.9
Type III	27	3.0
Type IV	651	74.6

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The pleura and blood typings are as follows:

	Blood	*Pleura*
Type I	10	6
Type II	2	0
Type IIa	6	0
Type III	6	3
Type IV	26	5

This further emphasizes the importance of Type IV. Unfortunately the diagnosis and records given to the laboratory early in the history and during the influenza epidemic make it impossible with accuracy to line up all these determinations with diagnoses, and they are given here simply to show the relative importance of pneumococcus typings.

Sputum bacteriology on the measles cases from July to the end of November is available and satisfactory on 29 cases. Two of the pneumonias were due to Type IV pneumococcus, or at least had this organism in predominance; these cases were not followed by empyema, so that the bacteriology of the pleural cavity is not at hand. One case was due to Type I pneumococcus and this was followed by Type I pneumococcus pleurisy. The hemolytic streptococcus was in pure culture or predominance in 15 cases, in 2 of which there was a hemolytic streptococcus pleuritis and in 1 a pneumococcus Type IV infection of the pleura. Pneumococcus and hemolytic streptococcus were present together in equal numbers only once. The influenza bacillus was in predominance once. The *Staphylococcus aureus* was not in pure culture or predominant at any time but was associated with the *Micrococcus catarrhalis* twice in cases in which the pneumococcus and streptococcus did not play any figure, but the staphylococcus was present to a noteworthy extent with the pneumococcus and streptococcus three times. The catarrhalis and non-hemolytic streptococcus were associated three times and the non-hemolytic streptococcus was apparently the causative agent in one of the cases of pneumonia.

Pleural bacteriology is available on 17 cases of which 10 were either sterile or grossly contaminated. Of these pleural effusions none gave a double growth. Two were due to the pneumococcus, Type I and Type IV, two were due to hemolytic streptococci, two were due to *Bacillus influenza* and one to *Staphylococcus aureus*. The influenza cultures were obtained in two cases of pneumococcus and bacillus influenza pneumonia. The staphylococcus empyema followed a pneumonia in which the sputum gave a reading of pneu-

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mococcus predominating, non-hemolytic streptococcus and staphylococcus aureus in about equal numbers.

The bacteriology of the post-mortems during the period from September 8 to November 24, 1918, shows that the pleural cavities when they gave fluid contained hemolytic streptococcus 9 out of 25 times; that is, all the cases of sero-fibrinous or purulent pleuritis were due to this organism. The lungs, on the other hand, never gave a pure culture but always some mixture of the following organisms: pneumococcus, streptococcus of hemolytic or non-hemolytic variety, staphylococcus, *Micrococcus catarrhalis* or influenza bacillus. Cultures from the 25 autopsies showed in 13 hemolytic streptococcus in predominance, while only 2 showed pneumococcus Type IV predominating. The heart's blood shows a very distinctly similar condition; of 23 cultures, 13 had hemolytic streptococcus pure or predominating, 2 a non-hemolytic streptococcus and 3 a pneumococcus, 1 of Type II and 2 of Type IV. This evidence of septicemia was carried further by the discovery of predominating streptococci in 7 out of 22 spleen cultures, 4 out of 19 peritoneal cultures, and 1 out of 13 pericardial cultures. The involvement of the sinuses of the head is shown by the following figures: of 12 cultures 6 showed hemolytic streptococci, 4 influenza bacillus and 3 pneumococcus.

It seems desirable at this point to emphasize the ability of the hemolytic streptococcus to incite and continue an inflammation or septicemia on its own hook. The pneumococcus, on the other hand, is seldom in pure culture or approximating that condition, but is much more frequently associated with other accepted pathogenic bacteria. This is best shown in our statistics of primary lobular pneumonia, but also holds in the above figures as given for measles.

The bacteriology of the infections of the ear and related structures of the first two periods is not very distinct, but the following figures can show the status of affairs for the fall of 1918. Forty-three cultures are recorded and sufficiently accurate for quotation; of these 6 were either sterile or grossly contaminated, 34 showed hemolytic streptococcus, either pure or greatly predominant, and 3 showed staphylococcus. It is noteworthy that there were no pneumococci isolated from these cultures, an organism frequently encountered during the previous outbreaks.

There were ten blood cultures on the measles-pneumonia, all of which remained sterile.

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HANDLING OF MEASLES IN HOSPITAL

The treatment of measles followed at this camp was established by Maj. W. W. Hamburger in December, 1917, and has been followed with very minor changes since that time. It is as follows:

1. Care on entrance into ward:
   - Bed warm.
   - Protection during giving of bath.
   - Enema if bowels have not moved.
   - Cathartic pills.
   - Mouth, nose, and teeth hygiene.
   - Specimen of urine to laboratory.
2. Care during febrile and eruptive period:
   - Semi-liquid or soft diet.
   - Sponge-bath for temperature of 103° F. or over.
   - Push liquids—water, milk, diuretics.
   - Medication for adequate rest, sleep, and control of cough.
3. Care during decline of fever and convalescence:
   - Full diet as soon as possible; nourishment between meals.
   - Daily alcohol rubs.
   - Prolonged rest in bed, getting up gradually in forenoon and afternoon.
   - Protective clothing while getting up; not to put patient to work in corridors.
   - Sufficient food.
4. Treatment of complications:
   - Early diagnosis of pneumonia, with early digitalis therapy.
   - Early diagnosis of otitis media, empyema, mastoid disease, etc. Daily leucocyte count.
5. Ventilation of ward:
   - Temperature 65 to 70 degrees.
   - Ventilators open.
   - Good air circulation.
   - Windows open from top only.
6. Care in transfer to other wards:
   - Ample protection with blankets, litter or wheel chair, if unable to walk.
7. Discharge from hospital:
   - Minimum of 28 days.
   - Back to normal weight.
   - Seen by special examiner before discharge.
   - Free from infective symptoms.
   - Free from complications.
   - Normal specimen of urine.

MEMORANDUM ON TREATMENT OF EMPYEMA

1. Every bronchopneumonia and lobar pneumonia, severe sepsis, continued high temperatures without demonstrable cause, severe continued dyspnea, particularly when accompanied by a sense of marked discomfort or pain on breathing, fulness or tightness in the chest, shall be considered *potential empyema*, and be observed constantly with this possibility in view. Daily leucocyte count.

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2. Each potential empyema shall be X-rayed within 48 hours of admission, providing patient's condition permits.

3. Each potential empyema shall be seen by the special empyema surgeon within 48 hours after admission for consultation regarding exploratory thoracentesis.

4. A positive thoracentesis shall be followed immediately by potain, withdrawing as much fluid as compatible with patient's condition. A specimen of such fluid each time obtained shall be sent to the laboratory for examination.

5. Proved cases of empyema shall be examined daily, and X-rayed and tapped at least every third day. Upon the fluid becoming opaque and of cream or puree consistency, patient shall be transferred to Surgical Service for continuous drainage with suction apparatus, unless ordered otherwise.

The stages of pleuritis which tends toward the development of creamy pus have been divided here as follows:

Stage I: Acute stage, preceding the development of pleural fluid:

Temperature, 103°–104° F.
Pulse, 110–112.
Respiration, 34–36.
Leucocytes, 12,000–15,000.

Stage II: The development and demonstration of serous or seropurulent fluid:

Temperature, 100°–101° F.
Pulse, 100–110.
Respiration, 30–34.
Leucocytes, 14,000–18,000.

Stage III: The development and demonstration of "creamy" pus:

Temperature, 99°–100° F.
Pulse, 100.
Respiration, 30.
Leucocytes, 20,000–30,000.

Stage IV: Following the development of "creamy" pus the leucocytes generally fall.

This scheme holds good for all empyema, and our rules for observing the cases were alike. As the condition develops, the temperature, pulse, and respiration tend to fall and the leucocytes rise, together with which there is an abatement of the patient's symptoms. In unfavorable cases the pulse and respiration tend to rise and the temperature to fall. The time of election for surgery has been found here to be the demonstration of creamy pus, the low point of the temperature, pulse, and respiration after the primary rise, and when the leucocytes are settling down after their original increase. The pulse rate is a very good guide.

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MEASURES IN CAMP

When the great problem of combatting measles, streptococcus and pneumococcus in the camp was first seriously studied, a large number of recommendations were made, but for military reasons only a small percentage of them were practicable. Those adopted were toward the separation of individuals and the limitation of their intimate contact. The whole camp was supplied with sheets for bed cubicles. Instruction was given by organization medical officers in the methods by which infections could be avoided. Arrangement was made with the transportation companies to limit the number of men on cars. Men appearing at sick call were immediately masked. A sheet was spread down the mess table so that the men could not cough or sneeze at their vis-a-vis. As far as possible it was the intention to divide men into groups in the squad rooms and keep them together and away from other groups. In order to avoid crowding in the latrine a guard was placed there. Places of assembly, such as Y. M. C. A. buildings and exchanges, were to be closed after retreat and only open during the day to members of unquarantined organizations. Entertainments were to be held in the open air as much as possible. A detention area was established, strictly guarded and, as far as possible, divided into small groups.

The separation in measles immune and non-immune was done during the summer, but the camp sanitary inspector's chart would seem to indicate that this did not protect completely, for the measles appeared after the men were distributed into organizations.

It was thought that many of the communicable diseases were contracted because the man was in a state of low resistance, due to his short service under unusual conditions, very hard work, and its consequent fatigue. It was proposed, and in a measure carried out, that the training schedules of the first three weeks of service should be very light in order that men might become acclimated to their new mode of life.

Perhaps the most important and constructive change inaugurated here was the abolition of the sick call as the only means at the disposal of the organization surgeon of discovering the health of his troops, and the substitution of the so-called medical inspection. By this arrangement a medical officer was supposed to see every day all the men in his company and to make a sufficient examination to insure himself that they were not in the incubation period of a communicable condition. It is thought that the low

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death rate is probably due to this, especially in the influenza epidemic. The examination of anyone discovered ill should be performed in a properly heated room of the infirmary, where the soldier should be stripped to the waist and a thorough clinical examination carried out.

MEASURES IN HOSPITAL

From the infirmaries patients were sent, properly masked, to the base hospital and were received by masked individuals into a cubicalized receiving ward. Bed patients were not obliged to wear their masks in the wards, but every other person about the wards did so. In the hospital area all the wards had cubicles, and the mess halls were equipped with longitudinal table sheets.

From February, 1918, to the middle of the influenza epidemic, all measles cases coming into the house were swabbed for the streptococcus carrier state with the discovery of a positive result in 46 per cent of patients. This, however, varied, being high in the spring (77 per cent in March) and low in summer (34 per cent in July). Two kinds of wards were kept, so-called clean and dirty, to which respectively non-carriers and carriers were distributed. It has been definitely shown by Levy and Alexander[2] that complications are definitely more common among carriers than among non-carriers. It does not follow that these complications must be streptococcal in nature, but they are so in the vast majority of cases. Clean wards are likely to remain clean unless due to faulty technique or the quarantine is not rigidly adhered to. One small outbreak of bronchitis and pneumonia occurred in a clean ward, apparently due to the carelessness of an orderly. When he and the infected cases were removed, the ward remained clean. When practicable, clean wards were swabbed every week and any patient with a suspicious culture was removed. Experimentation with disinfection of the nose and throat for this state has proved unsuccessful, and our attempts have taken the direction of isolation rather than chemical treatment.

The foregoing is the history of measles with its important features as seen at Camp Zachary Taylor from August, 1917, to the end of March, 1919. It cannot be considered entirely by itself, but must be read together with the existing pneumococcus and streptococcus diseases; that they have very profoundly influenced the morbidity and mortality is obvious. The incidence (the total

2 Levy and Alexander, J. A. M. A. June 15, 1918.

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cases were 2,871) per population is not available because the actual number of men who have been in this camp is not known, but is probably around 200,000; at this figure the incidence would be a little over 1 per cent. The percentage mortality of measles cases is 3.4. The experiences worth emphasizing are the value of sick inspection, the separation of streptococcus carriers and non-carriers, and the close association of the medical officers in the camp—the Camp Epidemiologist, the Chief of the Medical Service and the Cantonment Laboratory—a combination which has been agreeably consistent at this post.

REMEMBER THE ANNUAL MEETING IN ST. LOUIS, MISSOURI, FROM OCTOBER 13th to 15th.

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WAR DERMATOLOGY IN FRANCE AND THE PREVENTIVE MEASURES TAKEN[1]

By Lieutenant Colonel FRANK CROZER KNOWLES, M. R. C., U. S. A.
Consultant in Dermatology, American Expeditionary Force

ACCORDING to the tables of organization of the Medical Department of the United States Army, dermatology is placed under the section of Urology.

The Section of Urology, American Expeditionary Force, consisted of a senior consultant, consultant in urology, and two consultants in dermatology located at consultants' headquarters at Neufchateau; a consultant in urology for the base section; a urologist attached to each division of the American Army in France; to each base section, intermediate section, to each large hospital center, and also to many of the base, evacuation and field hospitals.

The duties of urologists varied considerably, depending upon whether connected with individual camps or hospitals, hospital centers, divisions, corps, armies or the central headquarters. In the main, however, the problems handled by the various representatives of the section dealt with the prevention of venereal and skin diseases, prophylaxis, drink control, regulation of houses of prostitution, restriction of illicit intercourse, cooperation with the military police and the French authorities, bathing, cleanliness of clothing, disinfestation, restricting lice and scabies to the minimum number of cases, and the diagnosing and early treatment of the common diseases of the skin, particularly those of animal parasitic or pyodermic origin.

Dermatology offers a tremendous problem in warfare. In the medical history of past campaigns we may read as to the extent and severity of skin diseases. Figures collected during the American Civil War show that out of an army of 600,000 men, 32,000 cases were diagnosed as itch, and an additional 35,667 were recorded under the heading of skin disease. The severity of the former gave rise to considerable controversy as to its pathology. Cases of itch were counted by the hundreds of thousands during the Napoleonic campaign. Sir John Pringle, in his excellent treatise on diseases of the army in camp and garrison, refers to the prevalence of these animal parasitic affections. The New Zealand and South African war records show an analogous condition.

Figures that have been collected show the prevalence of scabies and lice among troops in the forward areas. In tables given by MacCormac, out of a total of 3,878 admissions in his hospital (British) between No-

[1] Manuscript submitted to the Section of Medical History of the War, Library Division, S. G. O.

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vember, 1915, and July, 1916, 1,105 were scabies (nearly 80 per cent), while in another hospital (British), out of a total of 8,605 cases admitted between August, 1916, and April, 1917, there were 1,192 cases of scabies or 14 per cent. During the writer's twelve months' tenure in a large British general hospital, there were almost 2,000 cases treated in the dermatological service, and of this number over 500 were scabies.

According to Captain Parkinson of the R. A. M. C.: "At the head of diseases which actually cause loss of efficiency is scabies, and its frequent sequela, impetigo (or ecthyma). Impetigo means a loss of 10 or 12 days at the base, and scabies means a loss of 50 per cent of a man's efficiency from loss of sleep by itching and scratching."

Semon and Barber give a table of 669 cases of skin diseases admitted to one British hospital between April 1 and May 9, 1917, of which number 171 were scabies, 257 were pediculosis and 24 the combination of the two.

Peacock found lice upon 95 per cent of the soldiers who had been at the front in the British Army for 6 months or more. The average infestation was 20 lice per man, while over 10,000 lice and 10,000 eggs were found in the shirt of one man. He mentioned the interesting point that the further one investigated from the human host the fewer lice were found.

As an example of the prevalence of nits on the hairs, a few days following the admission of a large number of British battle casualties to a large hospital, I examined 200 patients, of which number 190 showed ovæ. Darier states that he can confirm the findings of Semon and Barber, and also of Bulliard, that nits of the body louse are frequently to be found on the pubic hairs, as well as upon those of the axillae.

Thibierge gives the following figures on scabies in relationship to the French Army. The statistics of three hospitals (St. Louis, Broca and Cochin), in Paris, were itemized by him for the years of the present war.

1913	None	1916, 1st quarter	493	1917, 1st quarter	836
1914, 1st quarter	99	2nd quarter	577	2nd quarter	1,409
1915, 1st quarter	131	3rd quarter	467	3rd quarter	2,098
2nd quarter	305	4th quarter	598		
3rd quarter	199		2,135		4,342
4th quarter	264				
	899				
Total					7,475

Professor Darier states that in his clinics (chiefly in Paris), out of 100 patients with skin diseases there is an average of about 15 cases of venereal disease, 47 of scabies and 4 of pediculosis.

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Captain Mook showed in his report for one month, on the skin diseases treated in the out-patient department of the American Red Cross Military Hospital No. 9, in Paris, that out of a total of 684 cases, 300 were scabies.

The division surgeon (42d Division, A. E. F.) reported in December 1917: "most important is that immediate action should be taken to overcome the loathsome condition due to body-lice, which exists throughout the entire command, varying from 25 per cent to 75 per cent, due to lack of bathing facilities, change of clothing, with close contact of men in hay trying to keep warm at night."

Physical inspection of 549 men, held by the sanitary officer of the 5th Division, A. E. F., showed 20 per cent affected with pediculosis and 6 per cent with scabies.

The division surgeon (82d Division) reported that on August 4, 1918, there were 65 cases of scabies; 57 of these came out of the 325th Infantry and 50 of them out of one battalion of this regiment. He states that this is entirely due to the fact that this battalion was kept in the front line or the support line for four weeks without chances for bathing, changes of underclothes, etc.

According to Captain McCague (urologist to the 3d Division), the 6th Engineers, which had been assigned to this division, showed a clean command. After three weeks of trench making, putting up wire, building dugouts, etc., investigation showed the fact that 60 to 75 per cent of the regiment were infested with lice.

The fluctuation of the scabies and lice incidence depending upon whether the division has just come out of the line or has been properly disinfested, bathed and issued with clean clothing is well exemplified in the following tables.

35th Division

Month	*Strength*	*Scabies*	*Lice*
July 9–31, 1918	14,026	114	....
Week ending Aug. 24, 1918	11,474	25	41
Aug. 29, 1918	24,728	41	44
Sept. 4, 1918	26,246	53	555
Sept. 11, 1918	24,783	49	321
Sept. 25, 1918	23,954	58	89
Oct. 2, 1918	16,272	1	23
Oct. 9, 1918	16,696	35	2,322
Oct. 16, 1918	22,158	37	119
Oct. 23, 1918	20,882	40	251
Oct. 30, 1918	20,291	1	87
Nov. 7, 1918	21,320	8	43
Nov. 13, 1918	22,849	101	703

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91st Division

August, 1918	19,975	17	9
October, 1918	20,042	16	321
November, 1918	10,330	133	1,591

26th Division

Organization	Number of men examined	Bath	Condition	Remarks
102 Amb.	Strength 115 eff.	1 week	Good, 10% ped.	Baths convenient.
102 Inf.	Strength 700	2-3 weeks	480 ped. and scabies	Just out of trenches.
101 Inf. 3d Bn.	Strength 500	Varied	Not good.	85%pedic.
K. & L. Companies				
102d Inf. K. Co.	Strength ?	Varied	Good.	Small%.
Mach. Gn. Co.	Strength 200	Varied	Fair, 50% ped.	150 bathing.
102 Inf. C. Co.	Exam. 70	.....	Fair, 55% ped.	Blankets not disinfected.
102d Inf. L. Co.	Strength 180	.....	Fair, 52% ped.	37 bathing, 80 blankets.
102d Inf. B. Co.	Exam. 25	.....	Fair, 39%	
102d F. H.	Strength 80	Regular	Good, 9% ped.	
102d Inf. D. Co.	Strength ?	.....	Fair, 42% ped.	
103d Inf. K. Co.	Exam. 225	.....	Fair, 52% ped.	
103 F. H.	Strength 80	Regular	Excellent, 0% pedic	Bath. & disinfector at at hospital.
101st F. H.	Strength 80	.....	Excellent, 9% ped.	Have bath and use of disinfector at 103 F. H.
U. S. A. Evac. Hosp. No. 1.	.....	.....	Excellent.	Bath. and disinfector.
104th F. H.	Strength 80	.....	Excellent, 1% ped.	Bath and disinfector.
102d Inf. M. I. L. K. Cos.	Exam. 480	.....	Fair, 38% ped.	
102d Inf. A. B. C. D. Cos.	Exam. 120	.....	Fair, 37% ped.	
102d Sup. Tr. Engrs. 1 Bn.	Exam. 300	Regular	Good, 12% ped.	
103d Infantry	Exam. 500	.....	Fair, 20% ped.	Infested 1 week ago.
103d Inf., H. Co.	Exam. 443	.....	Nearly 100% ped.	Just out of lines.
103d Inf., G. Co.	Exam. 240	.....	Nearly 100% ped.	Just out of lines.
104th Inf., Hq. Co.	Exam. 200	Regular	Good, 29% ped.	
104th Inf., C. Co.	Exam. 230	1 week	Excellent, 22% ped.	
104th Inf., F. Co.	Exam. 225	1 week	Excellent, 20% ped.	
104th Inf., E. Co.	Exam. 235	1 week	Excellent, 22% ped.	
Mach. Gn. Co.	Exam. 50	1 week	Excellent, 19% ped.	
101st Mach. Gn. Co.	Exam. 52	1 week	Excellent, 34% ped.	
104th Inf., D. Co.	Exam. 430	1 week	Excellent, 30% ped.	
1 Co. Engrs.	Exam. 200	1 week	Excellent, 16% ped.	

3rd Division

(During period July 1 to 31, 1918)

Organization	*Mean strength*	*Scabies*	*Lice infest, per cent*
Div. Headquarters	490	..	..
San. Tr. Headquarters	4	..	..
Amb. Sec. Headquarters	13	..	..
Amb. Co. No. 5	120	4	..
Amb. Co. No. 7	127	..	..
Amb. Co. No. 26	97	..	..
Amb. Co. No. 27	124	..	..
F. H. Headquarters	14	..	..
F. H. No. 5	83	..	..
F. H. No. 7	84	..	..
F. H. No. 26	83	..	..
F. H. No. 27	89	..	..
4th Infantry	3,676	12	70

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7th Infantry	2,616	..	50
30th Infantry	3,670	4	20
38th Infantry	3,760	6	30
7th M. G. Bn	418	..	10
8th M. G. Bn	650	2	15
9th M. G. Bn	650	..	5
10th F. A	1,637	6	15
18th F. A	1,693	..	10
76th F. A	1,671	..	12
6th Engineers	1,299	..	50
5th F. S. Bn	146	..	5
Amm. Train	1,182	..	10
Supply Train	512	..	..
Tr. Headquarters and M. P	357	..	..
M. S. O	10	..	..
M. F. L	5	..	..
Totals	25,280	34	..

Data on parasitic diseases in the intermediate and base sections will prove interesting. In the summer of 1918, six divisions, 39th, 40th, 41st, 76th, 83d and 85th were designated as Depot Divisions; in each of these divisional areas a so-called Classification Camp was constructed. These classification camps originally functionated in the handling of casuals, 90 per cent of whom came from base hospitals.

The Records of the 41st Division, 1st Depot Division, show the following:

Strength	Month	Scabies	Classification camp		Disciplinary barracks
			Scabies	Lice	Lice
10,760	June, 1918	89	.....	.....	.....
19,854	Aug., 1918	56	.....	20%	.....
13,895	Sept., 1918	10	51	10%	50%
18,061	Oct., 1918	26	53	12%	35%

The classification camp of this division during this period had a six-month average of 12,280 men per month, with a lice infestation of 12 per cent; 90 per cent of these cases came through base hospitals.

The classification camp of the 83d Division, 2d Depot Division, showed approximately 2 per cent of lice, and the interesting fact had been reported by Maj. F. M. Holcombe that vermin cases had been detected among enlisted men, formerly patients, coming from 25 base hospitals and 2 convalescent camps.

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The classification camp records of the 76th Division, 3d Depot Division, showed the ratio of 40 cases of lice and 12 cases of scabies in a total of 340 men. These cases also came from base hospital.

The data of the classification camp of the 40th Division, 4th Depot Division, showed that of 1,200 cases admitted from the Convalescent Camp, LeMans; U. S. Base Hospital Center, Vichy; Camp Hospital No. 13 at Mailly; and Base Hospitals Nos. 24, 67 and 89, Mesves, 28 showed lice and 22 scabies.

The classification camp of the 85th Division, 5th Depot Division, was never completed.

Of the first 200 cases passing through the classification camp of the 39th Division, 6th Depot Division, 12 showed lice.

Figures culled from the statistics of Base Section No. 1 give a general idea of the conditions in the various port sections.

Base Section No. 1.—Camp No. 4, outside of St. Nazaire, occupied by negro stevedores, showed seven huts infested with lice, each hut occupied by 90 men.

Camp Meucon

Strength	*Month*	*Scabies*	*Lice*
13,280	Aug., 1918	40	23
10,900	Sept., 1918	1	10
12,702	Oct., 1918	8	15

Camp Coetquidan

19,177	Oct., 1918	4	14

The 142d Field Artillery showed, at this camp, November, 1918, 120 cases of lice.

Camp Montoir: Prisoners of War, escort companies and enemy prisoners of war showed, for the month of October, 1918, out of 5,000 men, 1,722 cases of lice, and for the last two months but 4 cases of scabies.

The hospital center at Nantes gave the figures: 6,500 admissions during the month of October, 1918; 30 cases of scabies.

The hospital center at Savennay gave 16 cases of scabies out of 7,000 admissions during October, 1918.

Many other examples could be quoted, but the figures presented give conclusive proof that the longer a military organization is compelled to go without proper hygiene, clean clothes, baths, disinfestation, careful and frequent inspections, the larger will be the percentage of that organization infested with lice, itch mites, and secondary complications.

Scabies varies considerably in civil and military life and the following table will clearly show the differentiation.

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Scabies in civil life	*Scabies in military life*
Eruption usually on the lateral aspect and webs of fingers, consisting of pustules and burrows, excepting in those unusually cleanly, or those who work in oils, greases, graphite, etc.	Hands are involved in but few cases.
Penis frequently shows only one or two pustules and burrows and occasionally none.	Penis usually shows a marked involvement, numerous pustules and burrows.
Complications are absent in most cases.	Complications, such as an unusually large number of pustules, boils, impetigo, the so-called pyodermias (secondary pustular lesions) are frequently present.

Pediculosis corporis is much like that seen in civil life excepting for two main points: the secondary infections of the skin, pyodermias, are frequent and extremely severe, and the eggs of this type of louse are found on the pubic and axillary hairs in addition to being found in the seams of the clothing.

Pyodermia, the so-called "I. C. T." (inflammation connective tissue) of the British Army is one of the great prob'ems in dermatology in France and is chiefly seen during the autumn and winter months.

Semon and Barber found that out of 631 cases of pyodermia 452 were associated with parasitic infections. In my own experience in a British hospital with almost a thousand cases of this type, an even higher percentage followed either pediculosis or scabies or a combination of the two diseases. According to MacCormac, when severe pyodermic infections have occurred, a patient remains under hospital care on an average of 31.7 days, not including the additional time required in transport. According to Captain Blanchard (26th Division, A. E. F.) a number of chronic pyodermias have been in the division hospital for over a month. In numerous instances of this affection under my care a minimum of a month was required for cure. Pyodermic infection has been observed largely in the British forces and to a lesser degree in the French Army. Fortunately our own forces, because of the care used in prophylaxis (sterilization, disinfestation and hygiene), have been remarkably clear of these serious infections.

Pyodermia comprises, next to scabies and pediculosis, our largest group of skin conditions. The various common diseases which come under this heading are impetigo, ecthyma, septic sores, boils, folliculitis, Bockhart's impetigo, etc. The lesions of this group are largely located on the lower extremities. MacCormac describes splendidly the type of impetigo one sees in France, and I have seen hundreds of this type of cases in the British service. Few cases of typical impetigo are found.

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The primary impetigo corresponds to an ecthyma, in the sense employed by Sabouraud, *i. e.*, a dermic impetigo, of severe type and long duration. The legs and thighs are most frequently involved; sometimes the disease is very widespread, almost universal. The elementary lesion consists of an ulcer often astonishingly deep, covered over by a thick black crust; if this be pressed upon, pus can be freely squeezed out along the edges. A surrounding red halo marks the active extenson of the process; indeed, when the crust has been removed, a platinum loop can usually be passed under the skin for some distance, and this undermining makes treatment difficult.

Another interesting form of impetigo, a linear variety, exists, of which I have seen numerous instances, and which occurs chiefly in the legs and has longitudinal lesions, some an inch or more in length. According to MacCormac, a streptococcus, of the fecalis type, can be obtained from these lesions. It is therefore justifiable to assume that the eruption begins by some slight abrasion or scratch becoming infected with soil or water which has been contaminated with excrements.

Dermatitis of External Cause.—Under this classification is included a very large group of patients suffering from papular wheals all over the body, due to flea bites. The cases are similar to those in the Southern States due to "chigger" bites, but the lesions are larger, more profuse, and more troublesome. At times they greatly resemble scabies in that they are located on the penis, axillae, lower buttocks and elbows. This localization is the exception and not the rule, but, when it occurs, is at times confusing. These flea bites in many instances have been diagnosed as a papular type of urticaria. The flea is from one to two microns in length and of a brownish-black color. Cold weather eliminates this pest; they did not exist in France last winter.

Urticaria is frequently observed, no doubt due to differences in diet and the mode of living in a strange country.

Toxic erythema is often observed in the wounded following injections of anti-tetanic serum.

Dermatitis factitia has been observed in a few instances, and, as malingering exists in every army, this self-produced eruption will constantly have to be considered.

The various tables what follow show the other skin conditions which have been observed and the proportionate frequency of their occurrence.

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TABLE I.—*Admissions to Hospital A.* (British Skin Hospital.)

	1915		1916						Total
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	
Impetigo	122	172	151	161	220	170	147	116	1,259
Boils	24	59	50	51	42	36	65	48	375
Scabies	95	770	170	8	25	5	9	23	1,105
Dermatitis	7	10	10	11	11	8	8	7	72
Psoriasis	11	24	17	17	29	21	36	29	184
Seborrhea	8	12	12	11	40	18	18	11	131
Eczema	7	22	18	11	37	22	33	31	181
Pediculosis	.....	17	62	69	36	3	5	6	198
Erythema	3	7	5	.....	4	1	.....	1	21
Ecthyma	.....	.....	1	2	.....	.....	.....	.....	3
Pityriasis rosea	3	2	2	5	3	2	2	3	22
Folliculitis	1	11	13	9	8	2	5	1	50
Urticaria	2	4	3	3	2	11	8	1	34
Herpes zoster	2	2	2	.....	3	3	1	.....	13
Ichthyosis	.....	.....	1	.....	.....	.....	.....	1	2
Acne	6	22	19	12	8	6	10	7	90
Sycosis	4	2	4	1	3	2	5	7	28
V. D. S. (syphilis)	8	13	4	3	6	4	17	16	71
Carbuncle	2	4	3	1	4	2	1	2	19
Lichen planus	.....	.....	1	1	.....	.....	1	.....	3
Sudamina	.....	.....	.....	.....	.....	.....	.....	2	2
Erythema nodosum	.....	.....	.....	.....	.....	.....	.....	2	2
Lupus	.....	.....	2	.....	.....	3	2	2	9
Erysipelas	.....	.....	.....	.....	1	.....	1	.....	4

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TABLE II.—*Admissions to Hospital B.* (British Skin Hospital.)

	1916					1917			Total
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
Impetigo	268	729	849	388	305	287	444	655	3,925
Boils	129	258	396	116	85	62	130	168	1,344
Scabies	92	223	201	54	135	143	183	161	1,192
Dermatitis	21	91	92	54	44	42	67	61	472
Psoriasis	24	40	34	41	38	32	52	46	307
Seborrhoea	7	24	25	19	46	34	70	69	294
Eczema	22	69	83	41	48	52	62	76	453
Pediculosis	8	14	8	14	13	8	14	4	83
Erythema		3	2	8	2	5	1	1	22
Ecthyma			2	3	3		1	3	12
Pityriasis rosea		2	9	2	4	1		3	21
Folliculitis		1	1		1	2	1	2	8
Urticaria	3	9	11	15	5	6	5	2	56
Papular urticaria	2			1		2			5
Herpes zoster	11	20	19	6	2	3	8	8	77
Ichthyosis				4	1	3	5	3	16
Acne	4	10	11	6	7	5	9	7	59
Sycosis	3	11	5	3	4	10	5	9	50
V. D. S. (Syphilis)	5	9	8	3	6	11	6	7	55
Carbuncle	22	26	43	6	1		1	6	105
Lichen planus	1	1		1					3
Sudamina				2			1		3
Lupus vulgaris and scrofulodermia	2	2	2	2		2	3	2	15
Erysipelas			2						2
Ringworm	4	1	1	1	3	5	5	5	25
Hyperidrosis	2	1							3
Hyperkeratosis palm	1								2
Rosacea	1					1			2
Alopecia			1				1		2
Lupus erythematosus				1			1		2

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The following table gives the variety and number of skin cases treated in a large British general hospital by the writer during a 12-months period:

TABLE III

Abscess	50	Lupus erythematosus	1
Angioneurotic edema	5	Molluscum contagiosum	1
Acne	5	Pityriasis rosea	10
Alopecia areata	5	Psoriasis	26
Acne varioliformis	2	Pompholyx	2
Boils	381	Papilloma	2
Callositas	8	Purpura	5
Carbuncle	7	Pediculosis corporis	10
Dermatitis herpetiformis	1	Pediculosis pubis	8
Dermatitis	35	Pernio (frost bite)	50
Epithelioma	2	Paronychia	3
Erythema multiforme	4	Seborrhoea	5
Erythema nodosum	1	Sycosis vulgaris	4
Erythema (toxic)	7	Scabies	510
Eczema	51	Septic ulcer	210
Eczema seborrhoeicum	6	Schoenlein's disease	1
Ecthyma	209	Syphilis (secondaries)	37
Erysipeloid	1	Syphilis (late)	15
Folliculitis	5	Tinea circinata	2
Herpes simplex	1	Tinea cruris	6
Herpes zoster	18	Tinea versicolor	3
Hyperidrosis	56	Tinea sycosis	5
Ichthyosis	4	Urticaria	7
Impetigo	122	Vitiligo	2
Keratosis palmaris et plantaris	1	Von Recklinghausen's disease	1
Keloid	1		
Total			1,913

TABLE IV

TABLE IV.—*Cases Treated in American Red Cross Hospital No. 9, Out-Patient Department, July 21 to August 21, 1918*

New Cases

Acne	21	Pyodermia furuncle	13
Derm. E. C.	181	Pyodermia impetigo	9
Eczema	4	Pyodermia paronychia	1
Herpes zoster	2	Pyodermia others	8
Pediculosis capitis	1	Ringworm	6
Pediculosis corporis	26	Scabies	300
Pediculosis pubis	22	Seborrhea	15
Pityriasis rosea	1	Trichophytosis	25
Psoriasis	6	Urticaria	5
Pyodermia ecthyma	6	Other diseases	32

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"Other Diseases"

Undetermined, probably parapsoriasis	1	Leucoplakia	1
Dermatitis factitia	2	Verruca	3
Epidermolysis bullosa	1	Tinea versicolor	5
Anti-tetanic urticaria	1	Mustard gas burn	1
Lichen planus	1	Erythema scarlatiniform	1
Acne varioliformis	1	Toxic erythema	1
Syphilis	6	Sebaceous cyst	1
Naevus unis lateralis	1	Pruritus	4

The following skin cases were under treatment in the area of the General Intermediate Supply Depot, Group F, A. E. F., on October 9, 1918:

Scabies	22	Lice	45
Crabs	7	Ringworm	1
Eczema	1	Pyodermis	50

The following dermatological cases were treated at Field Hospital No. 327, Urological and Dermatological Hospital for 82d Division, A. E. F., for month of July, 1918:

Pediculosis	27	Scabies	114
Impetigo contag	11	Furunculosis	10
Eczema	2	Psoriasis	3
Urticaria	2	Pityriasis rosea	1
Herpes zoster	1		
Total			171

The following skin cases were under treatment in the 82d Division, A. E. F., August, 1918:

Scabies	102	Acne vulgaris	1
Eczema	3	Psoriasis	1
Cellulitis	1	Furunculosis	4
Abscess	1	Urticaria	1
Pediculosis	2	Ulcer	2

STATISTICAL REPORT OF SKIN DISEASES IN 77TH DIVISION, A. E. F., FOR PERIOD JUNE 19 TO JULY 29, 1918, INCL.

Total number patients	280	Psoriasis	6
Total number days' treatment	3,397	Urticaria	5
Average duration of treatment	11.13	Impetigo	5
Scabies	191	Tinea sycosis	2
Dermatitis pediculosis	29	Tinea circinata	2
Pediculosis corporis	15	Herpes zoster	2
Eczema	8	Furunculosis	2
Pyodermia	7	Other skin diseases	6

Average duration of treatment of scabies cases ..... 9.5 days

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The period of treatment of scabies has been reduced from 12 days for the first cases admitted to 4.6 days for the last fifty cases.

STATISTICAL REPORT OF SKIN DISEASES, 77TH DIVISION, A. E. F., FOR PERIOD AUGUST 1 TO 31, 1918

Total number patients	110
Total number days treatment	642
Average duration of treatment, days	5.84
Scabies	79
Pediculosis	12
Eczema	2
Urticaria	3
Impetigo	3
Pyodermia	4
Herpes zoster	1
Furunculosis	2
Psoriasis	3
Herpes progenitalis	1
Average duration of treatment of scabies cases	5.9 days

The following skin diseases were treated in the 89th Division, A. E. F. during the month of August, 1918:

Scabies	72	Eczematoid dermatitis	1
Dermatitis, from insect bites	8	Pyodermia	3
Urticaria	3	Herpes zoster	3
Sycosis vulgaris	1	Pediculosis corporis	7
Tinea barbae	1	Pityriasis rosea	1
Eczema, induratum, chronic	1		

The following skin cases were under treatment in the 26th Division, A. E. F., on June 16, 1918:

Scabies	82	Pyodermia	13
Pediculosis	27	Impetigo	16
Psoriasis	3	Pityriasis rosea	1
Not yet diagnosed	1		
Total			143

During the month of August, 1918, 39 skin cases were admitted to the Skin Hospital of the 37th Division, A. E. F., which, with 18 cases remaining from July, made a total of 52 patients.

Scabies	33	Dermatitis	3
Psoriasis	1	Pyodermia	4
Pediculosis corporis	1	Herpes zoster	2
Urticaria	1	Ringworm	2
Eczema	1	Impetigo	1

Skin Hospitals.—As has been mentioned previously, there is but one hospital for the handling of skin cases in the American Expeditionary

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Force, and that is located in Paris. American Red Cross Hospital No. 9 is admirably adapted for the treatment of skin diseases. It was originally a Russian bath establishment containing 60 bath tubs. It has accommodations for approximately 100 skin cases in addition to those in the Genito-Urinary Department. There could not have been selected a more suitable type of building for the handling of the ambulant patients largely affected with scabies, because of the large number of baths.

The remainder of the skin patients in the American Army, mostly scabies, are treated in the small field hospitals in each division.

Treatment of Pediculosis.—The treatment of pediculosis of the body has to be considerably modified, since the discovery by Semon, Barber and Bulliard that this variety of louse lays its eggs on the hairs of the body. If no pyodermia exists, the patient is given a bath, his clothes sterilized, and the pubic and perineal hairs shaved or clipped. It is also a wise precaution to use the calomel prophylactic ointment, as it is always available, on the areas which are clipped or shaved.

The treatment of pediculosis pubis consists in clipping or shaving the hairs in the areas where there are nits and an application of the calomel prophylactic ointment. The clothing should be sterilized and the patient bathed.

Treatment of Scabies.—Many different treatments for scabies are now in use, and many drugs have been recommended. The following method is in use at the St. Louis Hospital, Paris, and has been generally adopted in the French Army for the treatment of uncomplicated cases of scabies:

1. Friction of the entire body except the face, with green soap, the friction to last twenty minutes and with special attention to the hands, the interdigital spaces, the wrists, the elbows, the knees, the pubis and axillae. The treatment should be carried out in a warm room.

2. Hot bath for 20 minutes, during which the patient continues to rub himself, especially in the regions above noted. Where a tub bath is not to be had, a shower apparatus is used, but the water must flow very slowly, and during the scrubbing a second application of soap should be made to prolong its action. The shower bath should last fully twenty minutes. In the army zones the latter method is often obligatory, though tubs are preferable.

3. After the bath the body is dried and the interdigital spaces again rubbed, this time with a rough cloth and soapy water, to insure opening of vesicles and burrows.

4. Application for fifteen minutes to the whole body except the face and the scalp of an ointment, consisting of 20 percent sublimated sulphur, combined with 10 per cent neutral potassium carbonate in lard, well rubbed in.

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The patient then puts on clean pajamas or shirt, drawers and socks, which he wears until the next day. In the evening the ointment is reapplied to the hands, elbows, axillae and groins.

5. The next day, twenty to twenty-four hours after the first friction, the patient takes a warm bath with castile soap to wash off the ointment. This bath should last fifteen minutes. On emerging therefrom, after drying the skin starch powder may be applied to the folds to prevent irritation.

The patient is then given his washed and disinfected clothing and returned to his organization. Thorough disinfection of all clothing has in the meantime been carried out.

This treatment can usually be completed in twenty-four hours and the French claim that if properly given, it cures 85 to 90 per cent of cases.

The treatment of scabies in the British Army, as carried out in the largest skin hospital, is as follows:

The patient is thoroughly rubbed all over his body with soft soap, then given a hot tub (not spray) bath for twenty minutes. He is then thoroughly rubbed with sulphur ointment B. P. (sublimed sulphur 25 per cent in paraffin molle). He then receives two rubbings of the sulphur ointment daily until he has had six and is then given a final bath and pronounced cured.

The treatment of scabies in our own army is as follows: The patient is thoroughly rubbed all over the body with soft soap for fifteen minutes, a hot shower is taken for fifteen minutes, more soap and a soft meshed cloth is used for friction, and then a twenty-minutes rub with sulphur ointment is carried out. All clothing is sterilized. The preparation advocated by the French, viz., sublimed sulphur 20 per cent, neutral potassium carbonate 10 per cent in lard, is employed. Personally I believe it would be wise to use the sulphur not stronger than 12½ per cent, as the American skin cannot stand as strong preparations as our Allies. Sulphur rubbings are given daily for three days. On the fourth day the patient takes a warm shower bath, using a mild soap, is given clean clothes and is sent back to his unit.

Method of Rubbing.—A noncommissioned officer is always present as the patient rubs himself or is rubbed. A minimum of twenty minutes is consumed for the rubbing of each patient. The ointment is rubbed in thoroughly on every portion of the entire cutaneous surface from the collar line downward. The ointment is rubbed in with sufficient friction to open the burrows, and the sulphur is purposely allowed to remain over the entire skin surface, excepting the face and scalp, after the rubbing is completed, so that if any of the acari have escaped they will be suffocated by the sulphur fumes.

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The efficacy of this three-rub method has been proven by the fact that Mook in the first 300 cases treated at the American Red Cross Hospital No. 9, had only six relapses and three cases of sulphur dermatitis.

Treatment of Pyodermias.—As in practically all of these cases the patient is anemic, not infrequently has lost weight and is debilitated, constitutional means for raising the general tone are necessary. Good nourishing food and tonics, such as iron, quinine, strychnine and arsenic are necessary.

The British advocate tincture of iodine, diluted with alcohol, in the treatment of ecthyma. MacCormac found that painting with 8 per cent nitrate of silver in sweet spirits of niter had an extraordinary and, in some cases, almost specific action. Personally I have found quite effective the old method of using white precipitate, 4 per cent in zinc oxide ointment.

Morrow's method is efficient in the treatment of impetigo, in which he removes the crust with a curette or cotton and sterile water, dries the area thoroughly and then applies a swab of a 20 per cent solution of silver nitrate, afterwards applying talcum or corn starch. One or two applications should suffice. White precipitate of mercury, 4 per cent in vaseline, is healing.

Septic Ulcers.—The treatment of the most severe of these lesions is rest in bed, and an application of dichloramine-T ointment, 1 per cent in cocoanut oil or ammoniated mercury 8 per cent, made in zinc ointment.

The local treatment of boils has been usually ichthyanol 2 to 4 per cent in vaseline, rubbed in thoroughly twice daily, or wet dressings of a hot boric acid solution. Sabouraud recommends a lotion of sulphur precipitate (10 per cent in 50 per cent alcohol) applied with a paint brush. I found the ointment suggested by Bowen, boric acid and precipitate of sulphur, 12½ per cent of each made up in vaseline, quite effective. Operative measures are required in a large percentage of cases.

Staphylococci vaccines should be given in all cases of staphylococci infections.

Prophylaxis.—Preventive measures against skin diseases have been the main problem in this department. The largest number of men that can be kept actively in the field the quicker military results are obtained. Data obtained from the statistical office of the Medical Department showed that the percentage of cases of skin infections and inflammations in relation to the total number of cases of sickness from all causes in the A. E. F. had arisen from 3.9 per cent in July, 1917, to 7 per cent in September, 1917. The June sanitary report of

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the 42d Division shows that the early diagnosis and treatment of scabies reduced the average number of days lost from 17.17 in April, 1917, to 4.5 in June, 1917, and from 12 days to 4.6 days in the 77th Division.

Preventive measures against parsitic diseases of the skin should be viewed under three headings, laundries, bathing, and disinfestation.

The unit on which bathing and disinfestation service should be based is the division. There should be at least two complete bathing, delousing and laundry units for every division. The bathing and delousing units should be combined in one establishment and of sufficient capacity to accommodate the entire division once in ten or fourteen days.

Laundries.—Since mobile laundries were ordered by the Quartermaster Department, one for each division, we need say nothing about this important link in the system of disinfestation, except that these establishments should be so located that they can easily receive underclothing from and resupply clean underclothing to their respective divisions. It is absolutely necessary, in order to successfully organize any scheme of disinfestation, that a reserve stock of clean underclothing be always at hand at all bathing and scabies establishments. Unless this is provided for the men, no satisfactory system can be devised.

Bathing.—Wherever baths are established, provision should be made for collecting the soiled underclothing and forwarding it to the laundry, and for the issue of clean underclothing. The interests of speed and economy indicate definitely that underclothing cannot be washed while the men bathe.

The choice of actual bathing installations has universally been that of a shower or spray. Tubs are being used only in scabies stations. There are many types of showers in use. The most available for the forward areas are the small 8 or 12 shower-head units like those manufactured by Charles Blanc, of Paris. A considerable number of these have been used by the United States Army in France. They consume relatively little water, are demountable and light, and are put up in hinged cases convenient for transportation. Other forms of bath sprays such as the Tabasco heaters and the Leblanc apparatus may be employed for areas further in the rear, where more permanent and extensive establishments must be placed with the large training and rest camps.

(*To be continued*)

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EDITORIAL

SIGNS OF REPENTANCE

Because one starts out wrong, forms a habit of thinking, and of written speech, and is possessed of the superlative "Freedom of the Press" which enables him to voice his views to all the public, is evidently no indication that there may not be, eventually, a change of heart and, if we may employ the term without undue animadversion, some "restitution."

For some years—and they have indeed been some years—we have borne with more or less patience the gibes, generally witty and sometimes just, which have been launched at our devoted heads as members of what we thought, and still think, is an honorable and unselfish profession.

We have always thought you were funny, *Life*. So have others, or you would not hold the place which you do among periodicals of your class. Your humor has been clean and clever, but we have regretted that you found it necessary to so flay us for things which we believed we knew more of than you did.

We have often wondered if you were really sincere in all the caustic, witty, and sometimes unjust things you said of us. We have wondered if you were a "Daddy" and still forgetful of the bitter anguish in your heart when you turned to us, perforce, to shield the "kiddie" from pain; to drive away, perhaps, the gray shadow of the farther shore which lurked in the corner of the sick room. We have wondered if it meant nothing to you that always, at any time, under any circumstances, when you were sick at heart with anxiety, you could summon us, for pay or mercy, either one, to come and help. We have wondered if you realized that we, as a profession, work for our own extinction—for the prevention of disease, not its cure. We have wondered if you really believed that we were callous, heartless, indifferent to suffering in any of God's creatures. We have wondered if it were really much fun to persistently ridicule a profession which made no retort, but went on as best it might under the age-old teachings of Aesculapius to alleviate, so far as was possible, the sufferings of your body, and further, to bring to you also, in many instances, the spiritual comfort which it is our common province with the clergy many times to render.

No, *Life*, we are glad to say that we have not believed all the things you have said. In the broad experience of mankind which the practice of our profession brings, we have been sure that behind the couched lance of ridicule, back of the shield of cynicism there has been a certain,

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perhaps reluctant friendliness, a shamefaced affection which for some reason you were loath to acknowledge. And it could hardly be otherwise. We stood beside your mother's bed when you were born; we carried you safely through the ills of childhood; we advised you in the wild days of youth; we came into your own house when those you loved were sick. We have gone to war for and with you, we have not stepped back from pestilence, and we have ever striven that we should know more, and be better men, "that your days might be long in the land."

And we are glad of the graceful acknowledgment which appears at the opening of your number for June 26 and which we reprint below. We trust it is an earnest that, aside from the fact that you find much in us to ridicule, you still believe that we are, after all, worth while.

JAMES ROBB CHURCH.

AN ODE TO OUR DOCTORS

Their dignity, their motor cars, their ease
And well-earned fees
(Those comfortable fees,
Those fees concerning which we've often joked them
In ways that may have, more or less, provoked them),
Ungrudged, they left behind, and marched away
In soldier khaki clad, on soldier pay,
To face Disease and Death in grimmer guise.
In hospital or field,
Beneath their own or alien skies,
Through miseries and horrors unrevealed,
They toiled to save, for Pity's gentle sake,
The human wreckage tossed in War's red wake.
Small glory, less reward
Our usages accord
To these who shared the danger, woe and pain,
Yet have no tale to tell of foemen slain.
Unlit by flash of sword,
Their homely epic ends
With thousands of our gallant boys restored
To life and home and friends.
So let us fill
Our cups with any liquid that may still
Be mingled by our beverage-concocters,
And pledge those quiet heroes, greatly daring,
Who gave themselves with cheerfulness unsparing—
Our Doctors!

—*Arthur Guiterman.*

THE ANNUAL MEETING

Attention has been called in the MILITARY SURGEON to the annual meeting of the Association which will take place in St. Louis, beginning on October 13 and lasting until the 15th. Col. F. A. Winter, M. C.,

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U. S. A., himself a St. Louis man, is in general charge of the arrangements for the meeting. The general headquarters will be at the Hotel Statler. Col. Nathaniel Allison, of St. Louis, is in charge of the preparations at St. Louis, and a letter from him to Colonel Winter gives the chairmen of the following committees:

Finance: Maj. H. W. Loeb.
Entertainment: Col. William Mook.
Reception: Col. Walter Fischell.
Program: Col. Eugene Opie.
Ladies' Committee Col. Vilray P. Blair.

The meeting this year is an important one, as there are a number of questions of importance to the Association to be brought up and decided on, and it is hoped that every member of the Association will make an extra effort to be present. This, the first meeting of the Association after the close of the war, ought to be of special interest, and it will be the endeavor of the committee to arrange an interesting and attractive program. As in former years, provision will be made for the ladies, and it is hoped that a number of them will attend.

The Trustees of the Medical Veterans of the World's War will meet in St. Louis at the same time as the Association, and the question of some affiliation of that Society with ours will be taken up. This body is made up of the following members: Brig. Gen. F. A. Winter, M. C., U. S. Army; Col. Hubert Work, Pueblo, Colo.; Col. Joel E. Goldthwait, Boston, Mass.; Col. George Brewer, New York City; Dr. John M. Dodson, Chicago, Ill.; Dr. Holman Taylor.

Further notice in detail in regard to the meeting will be published in an early number of the MILITARY SURGEON. In the meantime it is hoped that all members will make their plans to be present.

J. R. C.

AN OFFER OF, INSTEAD OF AN APPEAL FOR, HELP

Several times, through the medium of this section of the MILITARY SURGEON, which is our own particular province, we have asked the help of the members of the Association in the task of making this a still better publication. We are grateful for the response which has come in answer to our call, and in order to show that we are not oblivious to the precepts of the Golden Rule, we should like to say, here and now, that it will be a pleasure to us to assist, in any legitimate way that we can, any member of the Association who will take the trouble to write to us and state his case.

We are old fashioned enough to believe that membership in an association carries with it a certain obligation of that sort, and it occurs to

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us that we might at times be of use, in a personal way, to the membership of the Association.

It occurs to us that we might answer, or obtain answers to, questions in regard to official status, providing they were proper questions to be so answered. We are in a position to obtain information of this sort, which may be properly given out, and it will be a pleasure to do so, so far as lies in our power.

Further, our office is in the Medical Museum and Surgeon General's Library. It occurs to us that we might be of assistance in supplying information sought from that source to those who wish data relative to the preparation of papers, or for other similar purposes. These instances occur to us as along the line of help which we might give.

We shall be glad to answer any personal letter addressed to us asking help or advice, and will do the best we can to be of service.

We do not desire to be considered merely as an impersonal adjunct to the Association and the MILITARY SURGEON, but as a perfectly human member of the Association, and, as such, quite ready to take a little extra trouble to be of service to the others who belong to it.

And so, as we said above, we shall be glad to answer as best we can any inquiries sent to us, and to see in our office any member who may happen to be in Washington. J. R. C.

STATISTICS

It is entirely too soon after the conclusion of hostilities to quote statistics to any extent. Those will come later when the work of compilation has been carried out and completed. When this is done, there is little doubt that we shall see the same satisfactory advance which has marked the progress of methods and the improvement in technique. This is always a measure of satisfaction to us of the profession of medicine as an exponent of the power we are striving to reach. Though we have to concede to human frailty the impossibility of reaching the desirable *n*th power, which would be the absolute maximum of recoveries, there is no doubt that in the years which have marked the passing from former times to the present date, our variable has to a marked degree approached its limit.

The following figures seem of interest to us as proof of that approach —that betterment of conditions as to mortality which is our ultimate end and goal.

In the Civil War, the mortality, *from disease only*, was 65 per 1,000. In the present world's war, the mortality in the American Expeditionary Force, from the same cause, was 14.8 per 1,000, and of this number 12 were due to pneumonia. That is a stride ahead, surely. If we can

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eliminate the latter factor in the next war (granting the hypothesis that there is to be a next war), what a good showing we ought to make!

In the Crimean War, in 1855 and 1856, in Constantinople, there were 2,500 deaths in 12,000 patients admitted for disease. Of these, 1,900 were from intestinal disease. The death rate in this same hospital in 1855 was 24.5 per cent. About 650 deaths from typhus are included in this, and about 250 from cholera. The authority for these figures of the Crimea is, "History of the Armies of the Orient, 1855–6," by Medecin Chef Cattaloup, of the French Army.

Even these meager statistics form a basis for a measure of satisfaction, we think, and when the full statistics are available it seems highly probable that we shall have much to congratulate ourselves on as to improvement in our business of conserving effectives for the fighting force, and men for post-war life.

J. R. C.

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COMMENT AND CRITICISM

ORCHITIS AS A COMPLICATION OF INFLUENZA

During the latter part of 1917, while doing medical work in the camp hospital at Coetquidan, a number of influenza cases developed complications which were of importance on account of the military question as well as the medical.

The presence of any genito-urinary symptom, of almost any variety was, in the minds of some of the men, a foregone conclusion that the patient must have a venereal disease. Until Dr. Hugh H. Young took charge of the situation and put the urological department on a sane basis, it was almost impossible to treat genito-urinary cases without, to say the least, causing much suspicion and hardship to the innocent.

Naturally a man tried to conceal any condition which might be mistaken for something due to his own negligence, as the disgrace of a trial, even if followed by acquittal, caused much comment; consequently he suffered days before consulting the regimental surgeon. Men with mumps, which started in the testicles concealed their condition for days until the parotids swelled.

This was an artillery camp, and the men were doing hard work. The following illustrate another form of orchitis not often encountered, but, as the micrococcus catarrhalis wanders where it pleases, there seems to be no reason for not finding it in the genito-urinary tract.

Major X. Married, healthy children, no venereal disease. While playing football during his college days was struck on the testicles, causing them to swell; he remained in bed a few days at that time. A few years later, during an attack of influenza, both testicles swelled, which condition passed away as his other symptoms disappeared. He has never been ill since until the present time.

Admitted to the hopsital with a respiratory type of influenza with a temperature ranging from 101° to 105° F. Two days later complained of a dragging sensation in the testes.

Examination revealed both testicles epididymi and chords swollen and also the scrotum itself edematous. Rectal examination showed that the prostate was also markedly enlarged. Neither testicles nor prostate were especially tender, nor did they have the tense feeling that one usually finds in acute inflammations in these parts. There was only a feeling of weight which was relieved with a suspensory.

No urethral discharge present; specimen obtained showed no gonococci but many micrococci.

As his respiratory symptoms passed off all other signs did also, leaving no thickening of the epididymi.

Private A, aged 36, married, healthy children. Had gonorrhea twelve years ago; no complications; has not seen any signs since. Has not been in a position to be contaminated with a venereal disease for three months at least.

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Admitted to hospital with respiratory influenza. Temperature 103° F. Seven days in hospital developed a feeling of weight in scrotum.

Examination revealed a clear drop at meatus, scrotum, epididymi, chords and prostate swollen, but not tense or especially tender.

Microscope showed micrococci in large numbers; repeated smears failed to show gonococci.

Recovery as the other symptoms subsided with no permanent thickening.

LEO H. BERND, M. D.

A PSYCHOLOGICAL LIGHT ON MEDICAL DEPARTMENT ADMINISTRATION[1]

The purpose of this paper is threefold: first, to stimulate discussion on the importance of the psychological aspect of the administration of the Medical Department; second, to examine the methods of a number of administrators; and third, to draw conclusions as to the psychological basis of a successful administration. Perhaps this discussion should extend further than to the Medical Department, but Medical Department administration has been more closely studied by the author than any other theme. The author admits his limited knowledge of this really vast subject, but he hopes that others will take up the matter where he leaves off and will carry it much further with benefit to all.

Since the establishment of the Division of Psychology in the Sanitary Corps of the Army, untiring efforts have been made to test out and classify the brains of the men composing the emergency army. It is certainly befitting that those who occupy positions which demand so large a knowledge of practical psychology as executives should have a searchlight thrown on their methods of obtaining results.

It is by no means certain that the man with an "A" classification will be a good administrator, as he may have traits which interfere greatly with his ability to deal with men and to decide necessary issues in a judicial manner. It is safe to assume that the most successful administrators have "A" brains (very superior intelligence) or at least high "B's" (superior intelligence). A man with a "B ' classification is somewhat slower than he who has a higher rating, but he may have certain qualities of disposition and energy which render his success as an administrator certain. On the other hand, his decisions will be less rapid compared with his higher rated confrere, and will not be so often accurate. Not only the recent army tests, but educational experimentation for the past decade, reveal the fact that speed and accuracy go together, and that, contrary to our preconceived ideas on the subject,

[1] By Maj. Bertram F. Duckwall, Medical Corps, United States Army

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it is not the slow, apparently careful man who makes the least mistakes.

Having been associated with many administrators and having observed carefully the results they have obtained, I feel in a measure qualified to classify their methods. The first type of administrator is rather common. He is the one who will grow purple with anger and give vent to an unseemly exhibition of temper over trifles which were the results of his own faulty instructions to those under him. He will have many of his enlisted men in the guardhouse and will be constantly preferring charges or taking disciplinary action for all sorts of offenses. He is always disgruntled and makes everyone uncomfortable whenever he appears. Such an officer certainly inspires his subordinates with fear, not exactly of punishment, but of the exhibitions of ill-temper to which he gives way. It is a settled fact that men do not do their best work in an atmosphere of fear. Fear conduces to nervousness, loss of initiative, and mistakes. The mind is cramped and the sense of judgment impaired. The work of administrators of this type shows an inharmonious adjustment with their superiors of the line and a misunderstanding of the higher officers of their own corps. They nearly always have a "fight" on their hands due to their inability to gauge the psychology of those with whom they come into contact. Very often they are investigated by inspectors, as many complaints reach higher authority. Enough of their work may pass muster to cause them to be retained in the positions they occupy, rather than to be placed in a subordinate situation.

Another type of officer believes in administering his department from the top down, so to speak. He prescribes for his subordinates exactly what they shall do every moment. Such a course is bound to stifle initiative. The commanding officer will never receive suggestions, but depends on his own ideas entirely. Thus the organization, instead of benefiting by the coöperation of many high class brains working for the general good, is forced to operate with a single man's cerebration. The administration of this type of officer is marked by intense egotism. Bitter and destructive criticism takes the place of proper instruction. He makes snap judgments without examination of the premises and is wont by this means to do injustice to his associates or subordinates. Occasionally someone with audacity will call attention to some unfair ruling and the officer will often admit his error, but the majority of men will suffer in silence rather than risk the caustic comment which all too easily falls from the commander's lips. It will be noted that such an officer is usually a hard worker. He spends hour after hour outlining the exact methods by which his subordinates must do their work, and he is careful to check up to see that they follow the prescribed

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form. Sometimes the administration of such officers is marked by absurdities and flighty ideas which cause considerable mirth *sub rosa*, and which could easily be avoided if the officer's egotism were relaxed sufficiently to permit him to receive the suggestions of others, at least occasionally. This type is the product of too rapid promotion and of occupying an important executive position for the first time. In time the inflated ego may disappear if the officer really is a good administrator, but there is a percentage which never shows much change.

There is a type of administrator who will do everything himself. He is the busiest individual in the organization. He will give orders here and then rush off to give orders somewhere else, or will proceed to do the actual work without giving any orders. He impresses one very much like the proverbial "hen on a hot griddle." He is very kindly in his treatment of his subordinates, and nothing is too much trouble. He is well liked, and permits his subordinates to assume no responsibility. Consequently, he is working very, very hard while those under him have comparatively little to do. He is extremely conscientious in his work, yet his department fails to show the harmony with the rest of the organization, or even internally, which should be expected. While the commanding officer has been busy doing something, another matter happens which should have been avoided, and the officer is investigated by an inspector or has to explain by indorsement. Instead of taking the time to teach his subordinates to perform their duties in a proper manner, this administrator will often be heard to exclaim: "Well, if it is to be done right, I must do it myself." He really accomplishes very little and should most certainly be relegated to a subordinated position where, under a real executive, his energy could be utilized to the best advantage.

There is a type of administrator who believes in cultivating popularity among his subordinates in a smooth politician's manner. He is a "good fellow" with those under him and apparently takes them into his confidence on all occasions. He will grant their requests if he can without arousing inquiry from higher authority, and even when he cannot do so he will apparently accede, and then resort to some "underhand" method of defeating the matter. He hesitates to "hurt someone's feelings" and dodges main issues. He is lavish in his praise of a subordinate's work, but, as a rule, he is not thorough enough in his examination of the work to know whether it is good or not. He is too much bent on acquiring popularity to see more than the superficial aspect of things. If he recommends someone for promotion, he gives extravagant praise, but he seldom recommends such a thing unless the subordinate has ingratiated himself by acclaiming the popularity of the chief.

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When it comes to supporting his subordinates and carrying through a policy with firmness and decision, this administrator is sadly lacking. He is evasive and can scarcely be "cornered" into making a decisive stand. He will shift the responsibility as often as he can; he is in general what we vulgarly refer to as "weak-kneed." This type indulges in fawning tactics with those higher up in authority, and he demands the same sort of allegiance from those under him. An ugly term for this kind of conduct is "bootlicking," and it is strange how many administrators are led away from real issues by it. Subordinates are quick to appreciate the desires of the chief in this respect, and it is wonderful to note the favoritism which ensues. As would naturally be inferred, such methods cannot help but disorganize the department and cause efficient subordinates to become intensely disgusted.

The lazy administrator, strangely enough, may have a very successful organization if his subordinates are not of the same type. When men are thrown on their own responsibility, they proceed to learn that which will be of the greatest help to them as well as develop initiative. If the right men are in the right places, the organization will operate harmoniously. The trouble comes when something arises which demands the chief's responsibility, when unfamiliarity with the organization and faulty advice from subordinates cause the collapse of the system.

In contrast with all these types is one to be admired. He takes charge of an office and with a few well-directed efforts soon has the department coördinated and working. Harmony begins to manifest itself from the time he assumes the helm. Bickerings are eliminated and team-work is soon evident. Interference with the work by inspectors is rare, and the department seems to run automatically. Such an administrator usually has a pleasing personality, apparently has plenty of time at his disposal, seldom becomes angry, is just in his dealings with his subordinates, and is enthusiastic in the work. His success is very largely due to the justice which he accords those under him. Men work well in an atmosphere of impartiality, regardless of the amount of work they are required to do. Subordinates will often be heard to say to a newcomer: "The chief is strict about things, but he is square." That last word means so much to those of Anglo-Saxon descent.

The success of an administrator depends on his knowledge of the psychology of the men under him. A man stands or falls by the work of those under his direction, hence, an administrator must be able to judge the qualifications of anyone he assigns to any piece of work. He must be able to appreciate in a broad way the problems which beset

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those who are working for him. His mind should be open and his decisions judicial, yet withal a sympathetic element must ever be present. Personalities are beneath the real administrator.

The attitude of an executive is obviously that which he believes will bring out the best in those whom he commands to the ultimate good of the organization and of the service. The bullying attitude is all too common. Many officers remind one of the old schoolmarm with her rattan, attempting to beat knowledge into the brains of the pupils, rather than the dignified professor who stimulates initiative and research. Training is needed to develop the judicial attitude which alone is able to handle problems of organization, large or small. Spineless executives should not be tolerated; crises need officers of decision and firmness. The attitude which leads to constant "fights" is deplored. It is recognized that fights are occasionally necessary, but a good administrator will undertake such a move only when he has exhausted every other possible diplomatic method. It will be noted, however, that when such an officer does undertake to force an issue, he is usually the victor; his judgment is usually good enough to keep him out of trivial contests.

The author believes the future will see a closer examination of administrators by those who have the appointment of such officers. It is by no means impossible for the psychologists to develop tests which will indicate, in the main, the suitability of men for executive positions. This surely offers a broad and interesting field for further study.

Thanks are due Maj. George F. Arps, Sanitary Corps, for his criticism and suggestions with reference to this article.

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BOOK REVIEWS

HISTORY OF THE WORLD WAR, An Authentic Narrative of the World's Greatest War, by Francis A. March, Ph.D., in collaboration with Richard J. Beamish, Special War Correspondent and Military Analyist. With an Introduction by Gen. Peyton C. March, Chief of Staff of the United States Army. Illustrated with reproductions from the official photographs of the United States, British and French Governments. Philadelphia, Chicago, Toronto: The John C. Winston Company, 1918.

In this volume of some 700 pages, Professor March has followed the progress of the war particularly from the standpoint of the United States. It is, as it should be, frankly pro-ally, but not to the extent that either the efforts or the prowess of the enemy are minimized. It is a narrative history, but by no means confined to a narrative style and type. Access to official documents and reproductions of maps and photographs from the same source add authority to the text and to the illustrations.

It is divided into forty-nine chapters, beginning with a statistical résumé of the part which the United States played in the struggle. The circumstances and causes which led up to the commencement of hostilities are successively dealt with in the opening chapters, and the progress of the conflict followed thereafter up to the time of the armistice. As the authors state in the Foreword, it is a narrative history, and the chapters are divided so as to deal with individual events. This gives the work added value as a work of reference, for by reference to the chapter headings it is possible to pick up a summary of any particular phase without being compelled to search through extraneous matter for that which is sought. The ruthless policy of Germany in warfare is dealt with clearly in Chapter V, and the infractions of the Hague Convention by the use of gas and other means are set forth in Chapter XIV.

Among other chapter headings we note, "The First Battle of the Marne"; "German Plots and Propaganda in America"; "The Russian Campaign"; "The Defeat and Recovery of Italy"; "Health and Happiness of the American Forces"; and "The War by Years," while the last two chapters contain extracts from General Pershing's official report to The Secretary of War and from President Wilson's address to Congress on December 2, 1918.

Professor March has brought to the orderly marshalling of the events described the training of a man of letters, and the result has been a concise and accurate review of events which must have now and always a peculiar interest to his own countrymen; not only to those who were fortunate enough to make history on the other side, but that army here in the United States which by its untiring labor and unfailing support rendered possible the fruition of those who composed the A. E. F.

The Introduction is by Gen. Peyton C. March, Chief of Staff of the United States Army.

JAMES ROBB CHURCH.

THE CONTROL OF HOOKWORM DISEASE BY THE INTENSIVE METHOD, by H. H. Howard, Director for the West Indies for The International Health Board. Publication No. 8, The Rockefeller Foundation, New York City. 1919.

More than half the population of the globe live in infected areas, and permanent agencies are necessary to eradicate the disease. The only thing necessary to accom-

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plish this is the prevention of soil pollution. Disinfection of the soil has been a failure. The International Health Board tries to confine itself to examination of people infected and their treatment and cure. It also participates in education, but the installation of latrines and their maintenance are left to local health agencies.

Intensive methods of attacking the disease attempt the complete relief and control of hookworm disease within a given area. The relief is furnished by treating all infected persons until cured; this is the work of the International Health Board. The control of re-infection is the mission of the local sanitary organization.

The scheme for treating the infected comprises:

1. Mapping the territory, locating roads, streams, villages, houses.

Taking a census of the population, numbering the houses and recording names, age, sex, etc.

3. Examination microscopically of the feces of the entire population.

4. Placing all infected under treatment and continuing same until, by standardized microscopic examination, a cure is effected.

5. Public lectures, distribution of literature, house-to-house visits, etc., with general education on the dangers of soil pollution.

The average rate of infection in the West Indies has been found to be 65 per cent. With one medical director, two clerks, four microscopists, twelve nurses and one or two helpers (the unit force), and 150 to 200 cases per nurse there would be provision made for about 2,400 infected persons. This means that such a force can cover an area population of 3,600 persons, and approximately three months are required for this unit to complete its work. The nurses and microscopists are locally trained from men among the better educated laymen. All specimens for microscopic examination are brought by the nurses to the microscopists.

Three water-diluted smears are made and examined without a cover glass. If these are negative, the specimen is centrifuged and the sediment examined. The centrifuge carried twenty tubes, one for each case.

Thymol is still the anthelmintic of choice.

There are two methods of administration: (*a*) By the daily dose of 10 grains without diet or purge. The reduction in persons infected was from 29 to 31 per cent in an area containing 1918 infected, and the work took nine months. (*b*) The intensive weekly dose of thymol based on an adult dose of 60 grains, with preliminary and subsequent purge of salts. Fifty per cent are thus cured in two treatments. Only a small percentage need more than three treatments. The thymol is finely triturated with an equal quantity of milk sugar before administration and is thus most effective.

The experiments with oil of chenopodium in no West Indian colony have led to its general use. Toxicity is considered its chief drawback.

The sanitary measures for the prevention of hookworm diseases are treated in generalities: "The International Health Board does not undertake to advise as to the definite type of latrine to be installed in these areas of operation in the West Indies." "The finding of a satisfactory method for the disposal of sewerage at the rural home, one which the people may be brought to adopt and to carry out, and which will prove to be safe in actual experience as well as in theory, is a problem yet to be solved.

"The average cost per person treated for the period 1914–1917 is $2.13."

The author recommends a wide application of the intensive plan.

In commenting on this sensible and well-written little work of 190 pages, one is impelled to conclude that until the very definite solution of the uncinariasis problem is applied, the introduction of the sanitary privy into the life and home of the

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poor and humble, these efforts and this money are not buying a tithe of what they are meant to buy, and the problem will remain unsolved. It is the sanitary privy or nothing. A parasite is a parasite, and its instinct will cause it to seek its host if that host eternally consents to act as a host. The work done by The International Health Board is a tremendous stimulus to bringing these people to their senses. We hope it will succeed.

Dr. Howard's views on chenopodium are not shared by a large number of enthusiastic supporters of this drug in his own organization.

BAILEY K. ASHFORD.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interest of our readers and as space permits.

MESS OFFICER'S MANUAL. Illustrated. Philadelphia and New York: Lea & Febiger, 1919. Price, $1.50.

HYGIENE AND PUBLIC HEALTH, by George M. Price, M.D. Second Edition. Philadelphia and New York: Lea & Febiger, 1919. Price, $1.50.

RULES FOR RECOVERY FROM TUBERCULOSIS, by Lawrason Brown, M.D. Third Edition. Philadelphia and New York: Lea & Febiger, 1919. Price, $1.50.

PRINCIPLES OF NURSING, by Charlotte A. Brown, R.N. Philadelphia and New Yorb: Lea & Febiger, 1919. Price, $1.75.

ROENTGEN INTERPRETATION, by George M. Holmes and Howard E. Ruggles, M.D. Illustrated. Philadelphia and New York: Lea & Febiger, 1919. Price, $2.75.

APPLIED ANATOMY AND KINESIOLOGY, by Wilbur Pardon Bowen, M.S. Edited by R. Tait McKenzie, Major R. A. M. C. Second edition, illustrated. Philadelphia and New York: Lee & Febiger, 1919. Price, $3.50.

PULMONARY TUBERCULOSIS, by Maurice Fishberg, M.D. Second edition, illustrated. Philadelphia and New York: Lea & Febiger, 1919. Price, $6.50.

UROLOGY IN MEN, WOMEN AND CHILDREN, INCLUDING URINARY AND SEXUAL INFECTIONS URETHROSCOPY AND CYSTOSCOPY, by Victor Cox Pedersen, A.M., M.D., F.A.C.S., Major, Medical Corps, U. S. Army. Illustrated. Philadelphia and New York: Lea & Febiger, 1919. Price, $7.

CHRONIC TRAUMATIC OSTEOMYELITIS, by J. Renfrew White, Medical Corps (N. Z.), F.R.C.S. New York: Paul B. Hoeber, 1919. Price, $3.

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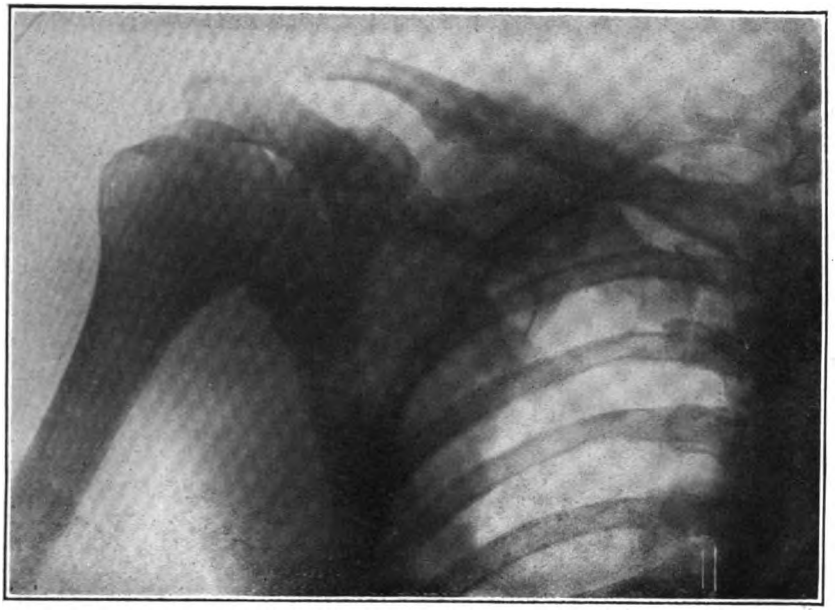
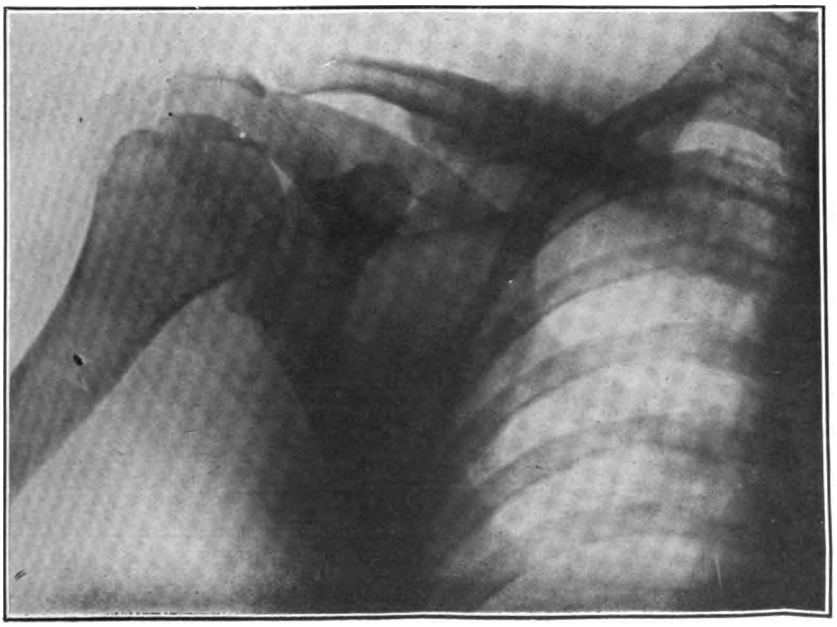


ROENTGENOGRAM No. 5556. END RESULT.

W. R. C. Fracture, comminuted, middle third, left. Injury received while engaging in football game by a comrade falling upon patient's chest. (Direct violence. Duration of application of splint, 27 days.



ROENTGENOGRAM No. 6359. END RESULT.

W. Q. W. Fracture, comminuted, middle third, left. Injury received while engaging in football game during a scrimmage. (Indirect violence.) Duration of application of splint, 27 days.

To face page 230)

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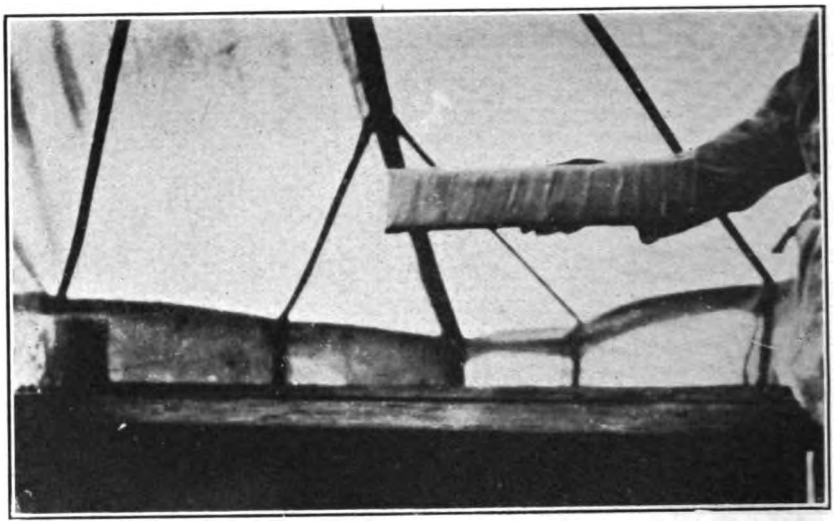

FIG. 1a.

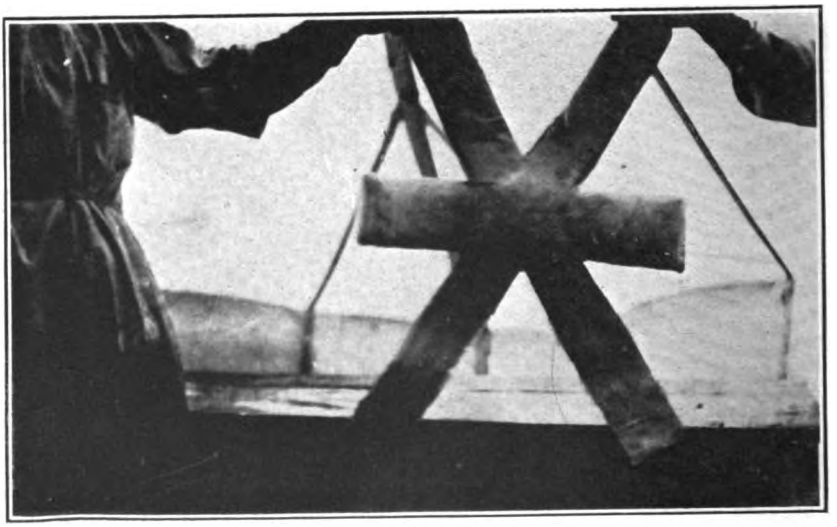

FIG. 2a.

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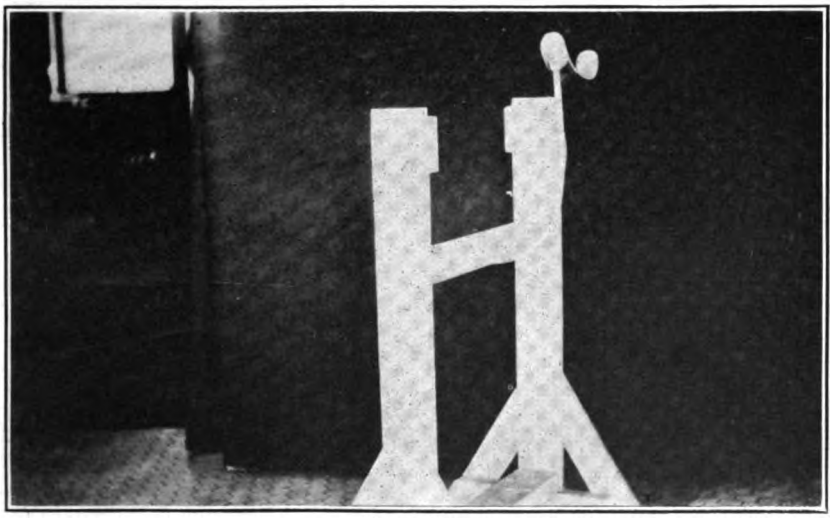

FIG. 1c.

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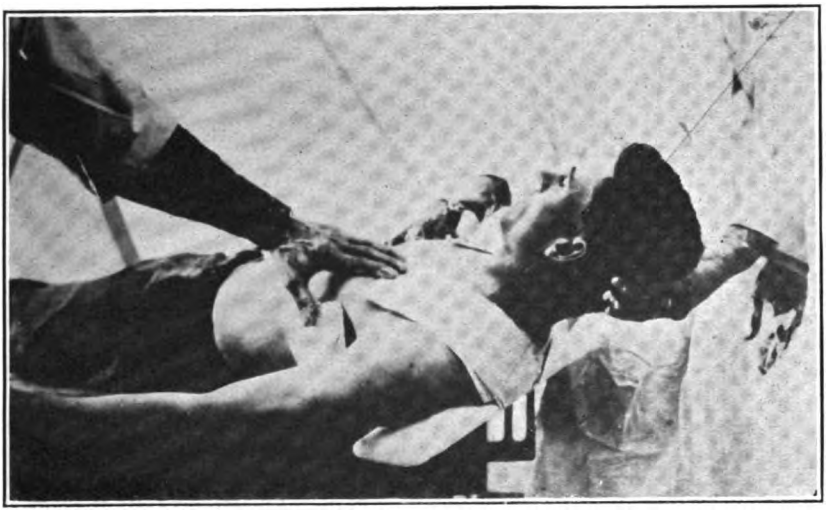

FIG. 3*a*.

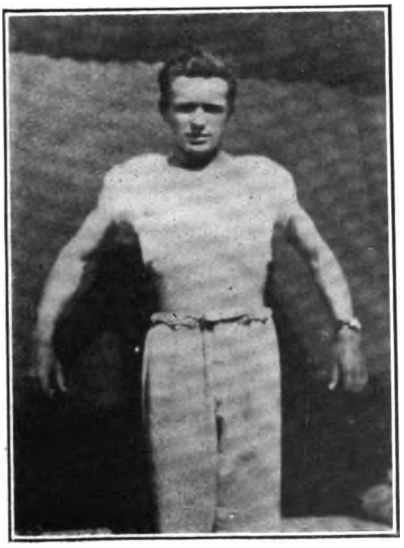

FIG. 1*b*.

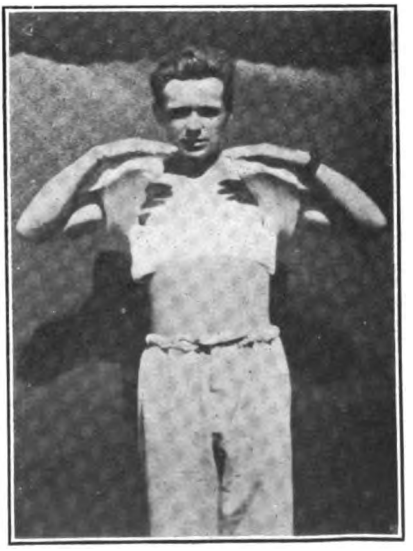

FIG. 2*b*.

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Fig. 3b.

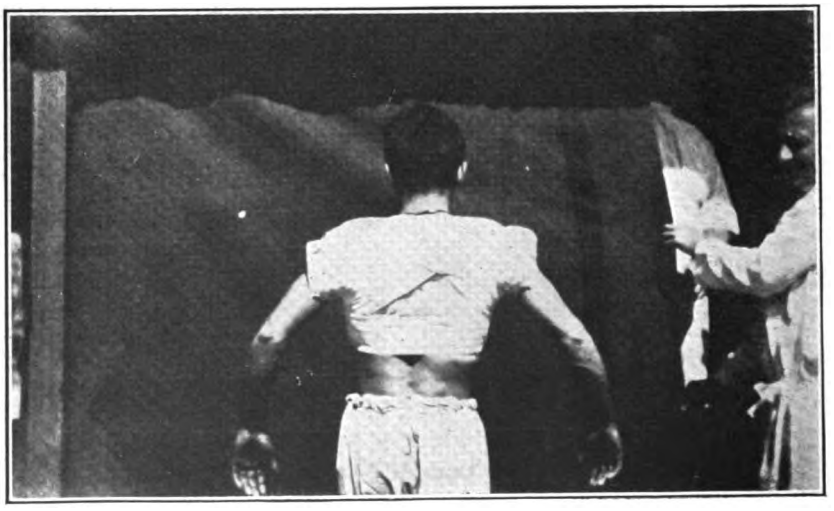

Fig. 4b.

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INSTRUMENTS AND APPLIANCES

A SPLINT METHOD FOR THE TREATMENT OF FRACTURES OF THE CLAVICLE

By Major DAVID H. LAWRENCE
Medical Corps, United States Army

(With ten illustrations)

Clavicular fractures being of frequent occurrence in the Army and the method of treatment being so unsatisfactory, led the writer to attempt a method which would meet the indications as to treatment and at the same time produce the minimum amount of discomfort to the injured soldier and return him to full duty within the shortest possible time. Apparent comfort of the temporary field splint across the back of the shoulders suggested the possibility of a permanent method of immobilization of the shoulder of the affected side.

Our first attempt along this line, September, 1918, was not satisfactory, due to the fact that ordinary gauze bandage was used in the application of the splint, which permitted the board splint to slip upward from its original position, thereby failing to hold the shoulder in an elevated position. Maj. H. P. Kulin, Chief of the Surgical Service at that time, suggested the idea of incorporating the board splint in plaster of Paris which was done according to the description of the method of application which follows:

METHOD OF REDUCTION OF FRACTURE AND APPLICATION OF SPLINT

Step 1.—Take a board approximately 20 inches in length, 4 inches in width, and three-fourths of an inch in thickness, and pad it well with cotton batting held by enough circular turns of a 3 or 4-inch roller gauze bandage to cover it, as shown in Fig. 1*a*.

Step 2.—Place the padded board upon a flat surface and measure upon the flat surface the length of the arms of a St. Andrew's Cross, each arm of which should be approximately 20 inches in length, measuring from the center of the board which is the seat of the intersections of the cross. Therefore each half of the cross will be approximately 40 inches in length or twice the length of the board. Take a 4-inch plaster of Paris roller bandage and begin at one of the four marked points and carry the bandage diagonally across the center of the board to the marked point on the table diagonally opposite to the starting point.

Repeat this procedure three or four times, then reverse the bandage on the center of the board and carry it to one of the other two marked points. From this point carry it back across the board diagonally to

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the last marked point on the flat surface, thence back to the point diagonally opposite, and repeat this last procedure three or four times.

Now take another 4-inch plaster of Paris bandage and apply it in like manner to the one previously applied. Now turn the splint with the plaster bandage upon the opposite surface and apply two plaster of Paris bandages covering over the two previously applied, and crossing the board in the same manner as before.

At this time the board will be incorporated between the plaster of Paris bandages and held firmly in position as shown in Fig. 2*a*.

Step 3.—Steps two, three and six may be dispensed with when a specially constructed table is available. However, our object is to demonstrate a splint which can be used in the field at any time, avoiding the necessity of having extra equipment. Procure a table of any character—the ordinary kitchen table will serve well, or the surface of a box, if large enough, is satisfactory in an emergency. Place the prepared splint across one corner of the flat surface with two of the arms of the plaster of Paris cross upon this surface and the other two held by an assistant. Now place the patient upon his back with the posterior surface of the shoulders resting upon the board splint with the spines of the scapulae resting midway between the upper and lower borders of the board. The operator now grasps the patient in the axillae and directs an assistant to pull forcibly on the patient's feet; by this means the shoulders are elevated and held by the body weight upon the flat surface. The arms of the patient are abducted to an angle of approximately 45 degrees with the mesial line of the body, the hands resting upon the backs of two chairs, the patients head resting upon the hand of an assistant. The operator now places one hand upon the anterior surface of each shoulder and forces the shoulders down upon the board snug and firmly, thereby increasing the distance between the acromion processes to the maximum.

While holding the shoulders in this position the assistants pull taut the arms of the cross over each shoulder and through each axilla, the ends resting upon the anterior surface of the chest, and must be held firmly in position for the next step. Step three is the most important one in the procedure, in that it is here that the reduction of the fracture takes place, also the elevation of the shoulder, as well as the temporary immobilization.

The work in steps two and three must be done rapidly before hardening of the plaster of Paris takes place, in which event the proper moulding could not be done. For the technique of this step see Fig. 3*a*.

Step 4.—Pad both axillae well with cotton batting. Take a 4-inch plaster of Paris bandage and place the initial extremity upon the posterior surface of the splint, about its center; then carry it outward and ante-

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riorly through either axilla, then up over the shoulders, backward and downward to the starting point, and repeat this upon the opposite side, thereby making a figure of eight of the posterior surface of the chest. These figures of eight are repeated until four or five complete turns have been made. Each turn should be drawn taut.

The operator should bear in mind that plaster of Paris shrinks upon hardening, therefore he should have the axillae well padded to prevent any interference with the circulation of the two upper extremities.

Step 5.—Take a 3-inch plaster of Paris bandage and make circular turns about each shoulder, incorporating each end of the splint; these turns should fit snug, thereby holding the shoulders firmly and securely against the splint.

One or two of these bandages will suffice, depending upon the amount of plaster of Paris incorporated in the meshes of the material of which the bandage is made. Keep the patient in this position for ten or fifteen minutes, *i.e.*, a sufficient length of time for the plaster to harden, having an assistant hold the lower arms of the cross snug against the chest.

Step 6.—Elevate patient to the erect sitting position with legs thrown over edge of table and with a 4-inch gauze, or plaster of Paris bandage, fix the lower arms of the cross by several circular turns about the chest; this latter procedure fixes the splint in such manner that there is no possibility of upward movement.

(*a*) An anterior view of the completed splint is shown in Fig. 1*b*, with patient's arms in their normal position while splint is being worn. Fig. 2*b* shows the same patient with his hands in position for feeding himself, while Fig. 3*b* shows the same patient with his hands in position for making his toilet.

(*b*) Figs. 2*b* and 3*b* demonstrate the fact that the use of the arms is due to a backward pull of the muscles drawing the shoulders backward away from the anterior parts of the splint and also elevating the shoulder, both of which movements are conducive to the best of results in the treatment of these injuries. Since there can be no forward movement of the shoulders, there is no possibility of the reduction being interfered with, and the patients are encouraged in the use of their arms for the further reason that their highly developed muscles will not lose their efficiency as the result of the treatment.

(*c*) Fig. 4*b* shows a posterior view of the splint when completed and in position. At first sight the appliance appears to be too massive and heavy, the fallacy of which is evident, however, when one bears in mind the fact that these patients are most highly developed from a muscular standpoint and extremely robust, brought about by their constant mus-

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cular training in the service, and are ambulatory and active during the time of treatment.

(*d*) The materials required in the application of this splint are usually found in the equipment of all medical field organizations, namely, half a dozen 4-inch plaster of Paris roller bandages, two, 4-inch plaster of Paris roller bandages and two 3-inch roller gauze bandages and half a pound of cotton batting. A board can always be procured.

FOR HOSPITAL USE

We are making use of a rack made of wood for holding in position the board splint during the fracture reduction and fixation. This rack should be made the same height as the table upon which the patient is to be placed, and stands on the floor at one end of the table. By the use of this rack steps 2, 3 and 6*a* can be eliminated, since the plaster of Paris (St. Andrew's) cross is not needed for holding the board in position. For appearance of rack see Fig. 1*c*.

Take 4 by 1 inch boards and cut them to the height of the table and brace them to prevent spreading. The uprights should be placed 21 inches apart, thereby allowing 1 inch for padding on ends of the 20-inch board splint. Stops are placed 1 inch from top of uprights to hold board splint in position. Take a piece of gas pipe or iron rod and bend same so that headrest will be approximately 6 inches from edge of board splint. This rod is made fast to upper cross brace.

The headrest can be made of wood or iron as desired; by the use of this rack the method of appliance is made easier in that the patient does not have to be moved until cast has been completed and hardened, at which time the patient can rise and walk about with comfort.

No anesthetic is required in the application of this splint, owing to the fact that the attendant pain disappears just as soon as the operator forces the patient's shoulders firmly down upon the splint.

Within two or three hours after the application of the splint these patients can be transferred to convalescent wards, inasmuch as they are able to care for themselves, having free use of their arms. They can feed themselves, make their own toilets, play games, and go about at will. The operator need not see them again until the time of removal of the splint (from 21 to 25 days, depending on union), as there are no further dressings or readjustments, with the exception of compound fractures, which are of infrequent occurrence.

Accompanying skiagraphs of end results of this method of treatment demonstrate conclusively that the reduction and fixation are much more satisfactory than can be obtained by the older methods in the same number of cases.

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They further demonstrate that some of these fractures would have of necessity been reduced by the open method (with its usual sequelae) had not the fixation been complete. In all cases admitted to this hospital since September 6, 1918, this method of treatment with no open reduction has been used and the patients returned to full duty.

The splint is very comfortable, and the men are able to take excellent care of themselves, while in the apparatus, properly applied, there is no axillary pressure and full use of arm is allowed.

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Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

1st Lieut. Herbert E. Brown, M. C., U. S. A.
Died October 25, 1918.

1st Lieut. Winfield S. Faulds, M. C., U. S. A.
Died in France.

1st Lieut. James Madison Graham, M. C., U. S. A.
Died April 4, 1919.

1st Lieut. Franklin M. Hawley, M. C., U. S. A.
Died March 12, 1919.

Capt. Elmer E. Holt, M. C., U. S. A.
Died July 1, 1919.

1st Lieut. I. M. J. Hotvedt, M. C., U. S. A.
Died February 10, 1919.

Lieut. Julius F. Neuberger, M. C., U. S. A.
Died April 1, 1919.

Capt. Thomas H. Orser, M. C., U. S. A.
Died April 20, 1919.

1st Lieut. Ralph E. Powers, M. C., U. S. A.
Killed in action, Archangel, Russia, January, 1919.

1st Lieut. John G. Skillings, M. C., U. S. A.
Died November 13, 1918.

Maj. Frederick S. Songer, M. C., Ill. N. G.
Died July 4, 1919.

1st Lieut. Judson Teeter, M. C., U. S. A.
Died January 15, 1919.

Maj. William D. Turner, M. C., Va. Vols.
Died October 12, 1918.

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THE
MILITARY SURGEON

VOL. XLIV SEPTEMBER, 1919 NUMBER 3

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

ABSTRACT OF REPORT OF PROFESSOR RUBNER MADE IN THE REICHGESUNTHEITSRAT, DEC. 20, 1917[1]

THE YEAR with the most important changes in the food-supply was, for the cities, 1916-17, beginning in part with the reduction of the meat ration at Easter, 1916, that of milk in the autumn of 1917, followed by a reduction everywhere of the food-supply in general. As regards quality, the diet for the cities up to Easter of 1916 was to a certain extent like the peace-time diet, the nutritive content of which, as reckoned for the whole nation, was as follows:

Of every 100 calories of nourishment there were:

	Calories		*Calories*
In milk	8.2	In bread	36.9
In Cheese	1.1	In flour	5.5
In eggs	0.8	In sugar	7.9
In meat and sausage	13.0	In potatoes	12.2
In butter	5.8	In vegetables	3.7
In other fats	4.9		

The city and country of course fared differently as regards the composition of the diet, and in several of the larger cities as high as 26 per cent of the calories may have been contained in the meat and 12 per cent in the fat, to offset which the other rations, as for example bread and potatoes, would show lesser amounts.

The diet of the cities, to be regarded in its deviations as a luxurious diet, was far more than sufficient; other forms of work, other life tasks and conditions exercised at least upon the diet an influence that was in many respects very important. Of the most widely used foods there

[1] The above report on conditions in Germany, and written by a German, is interesting as dealing with the question of food in Germany and its place in economics. Professor Rubner is not particularly optimistic in regard to any of the plans for rationing.

So far as we know this is one of the first papers published on this subject and should be of interest as treating a question which commanded international discussion.

The complete report is too long for reproduction *in toto*, but the excerpt covers sufficient to give a clear idea.—THE EDITOR.

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gradually fell away an essential part. How little coming events are appreciated is shown by a plan for the winter of 1916-17 published in the summer of 1916 by the Department in Charge of Food Supplies during the War, according to which the following could be regarded as guaranteed per day per person:

	Protein, Gr.	*Total calories*	*Of every 100 calories*
271 gr. bread	17.2	688	34.9
710 gr. potatoes	14.9	710	35.7
18 gr. butter	....	140	7.1
200 c.c. milk	6.8	111	5.5
70 gr. meat	10.7	158	7.9
0.3 eggs	4.2	53	2.6
32 gr. sugar	....	125	6.3
	53.8	1,985	100.0

This quantity was to be the simple individual ration; it was to be possible to obtain, besides this, considerable amounts of unrationed food, perhaps fruit and vegetables, or fish and polished barley. When autumn actually came the diet had become quite different. The ration per person and per day was really:

	Protein, Gr.	*Total calories*	*Of every 100 calories*
271 gr. bread	17.2	688	51.2
357 gr. potatoes	7.5	341	25.4
11.4 gr. margarine and butter	....	89	6.6
36 gr. meat	4.5	78	5.8
0.07 eggs	1.0	13	1.0
26 gr. sugar	....	104	7.7
9.8 gr. polished barley and doughstuffs	0.9	31	....
	31.0	1,344	100.0

Bread and potatoes constituted the bulk of this inadequate diet, and even this ration was not attained always. Polished barley and doughstuffs were delivered to the consumers in varying quantities, and the amount of meat was in many cities only one-third as large as here given. In place of potatoes "*steckruben*" was substituted; instead of 2 kg. of potatoes per week 2.5 kg. of steckruben were given out, and even this proportion was not everywhere maintained, therefore great quantities of steckruben were eaten.

On June 15, 1917, there came a favorable change in conditions, when the potatoes were used up, as now a little bread and meat were distributed as substitutes. In this decreased form of the rations 64.2 per cent of the calories were derived from bread.

It is impossible to balance the ration by unrationed foods as there was and is a shortage in the cities.

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On the whole, the entire diet of the nation, in so far as it was not improved by extra allowances, was made really that of the proletariat. Through the exclusion of animal foods it became monotonous and for many no better than the fare of prisoners sixty to seventy years ago.

Garnishings, spices—in short everything that might have served to improve dietetic qualities—were lacking. To an ever-increasing extent steckruben had to serve as food. Soup-like preparations and vegetables, above all, turnips of various kinds, were constantly reappearing. The chief characteristics of such a diet is its high water-content, in which the influence of protein stuffs, which strongly tend to precipitate water, is missing. Because of the lack of real tea and coffee there is lacking a diuretic action, which, in the case of an over-supply of water in the body, is usually very effective. Alimentary polyuria belongs therefore to the common phenomena.

Bread has lost much of its healthy constituency, and its digestibility has greatly diminished during the war. Steckruben belong, even after they have been carefully freed of all woody parts, to food-stuffs that are very hard to digest. They excite the intestines to a copious flow of digestive juices, hence there is a tendency to soft increment. The digestible qualities of the dried preparations, which in part were very carelessly prepared, is worse than that of good, fresh turnips.

Vegetables take up such an immense volume that even with the most splendid digestive organs one can not possible live on them alone. The diet available for the city dweller is a mixture that even in the case of the young and healthy must be counted among the foods that are hard to digest. As only that which is digested is of any account to the body, the present loss of digestible qualities in food means an enormous shortage in the daily ration. Furthermore, the distention of the intestines, due to the bulky vegetable diet, makes the nourishment of the body more difficult.

Bread has been adulterated with the ground-up seeds of weeds, hence the possibility of poisonous effects resulting from such seeds must be taken into consideration. Such additional ingredients as powdered spelt-flour, and even wood-flour, sometimes in considerable quantities, have been found in bread. The ingestion of such food-mixtures results in colic, flatulency and painful bowel movements, due to the hardness and dryness of the feces.

All the foregoing considerations show the inadequacy of the city diet, as it has been developed since October, 1916, at least. In its digestive qualities it ranks far below the diet we furnished in prisons before the war.

The more thoroughly we consider today the conditions of national

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nourishment in their effects upon the health, the more the conclusion is forced upon us that the blockade ane embargo compel us to get along with our own food-products. The real basis of the injurious effects to be traced lies mainly in the distribution of the food, which works more or less disadvantageously for individual sections of the nation, and certain groups of persons. In the very beginning we mentioned the fact that the distribution as between city and country has turned out to the disadvantage of the city. It was not necessary to change the composition of the diet of the rural districts, and it has in many sections, where it was very poor in meat, become richer in meat because of the establishment of the Imperial Meat Bureau. For further consideration of the subject we must examine the system of distribution, especially in the cities. This distribution of food is conducted in accordance with certain definite assumptions, among which the attempt to achieve a general regulation for the entire empire, and at the same time to procure the greatest uniformity of distribution, is hard to reconcile. The first system of rationing to be adopted, that of bread, was in the beginning absolutely uniform for every individual unit of the population, but soon had to be modified.

It is clear that the very principle of economy itself is violated by any system of rationing, and that such a system in and of itself, if it is made as "simple" as possible, comes into conflict with the attempt to supply a population with proper nourishment. Before this time, of course, we were acquainted with the rationing of persons of certain classes, as soldiers, prisoners, inmates of institutions, etc., but even in such cases where it was a question of uniform circumstances, similarity of age and occupations, etc., it was impossible to manage the affair without having reserves, extra supplies, and various means of maintaining a proper balance. The present ration, however, attempts to nourish, with little variation, infants, children, pregnant women, nursing mothers, persons working fairly hard, and persons working at the very hardest kind of labor, with an amount uniform for all, and over and above this with the same kind of food, through very limited supplies, given out at short intervals and throughout the entire empire. Any meeting of the real requirements by this simple scheme is impossible, and the result is that many, even if the total amount of the ration to be given out is too small, receive an adequate diet and others an inadequate one. Any evening-up of conditions among individual persons, as found in society, an institution, or in short in every larger association of persons, is limited at best to the family, and if there are but few persons in the family or if it is composed exclusively of adults, the possibility of an evening-up is very slight. Such a nation-wide system

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of food distribution, then, as compared with self-regulation, does not lead to economizing, but to a relatively larger using up of supplies. The meagerness of the rations supplied does not permit of any stores on hand, and so the nation lives from hand to mouth, always an uneconomical system. Whatever can be obtained is simply eaten up. This shifting of the food-supply necessitates a comparatively larger expenditure of the food than would be the case with a proper distribution.

The distinction is made between those engaged in munition making and the armament industry and the civilian population. The former are supplied with large amounts of extra rations, more with the idea of keeping them contented than with providing them with a necessary increase of food. The terms "hard worker" and "very hard worker" have been abused, and the wide latitude of interpretation given them has been used for the purpose of securing extra rations. In spite of many exceptions there remains, in the large cities especially, a considerable number of people who really receive only the uniform ration. The classification of callings is wrong, since there are especially in the academic professions a large number of persons who, partly because of actual physical strain, partly through intellectual efforts, partly through long hours of labor, require far more nourishment than is required by many workers in trades and industries.

Foods, especially those not rationed, have soared in price, which many cannot afford; this effects the working classes, who in part enjoy an enormous increase in their incomes, less than it does the government officials as a class and the middle class, who are more and more suffering from suspensions of business, and, being unorganized, have no redress. For many families the fatigue involved in making purchases, the waste of time, and often the physical weakness which makes it impossible to stand around for hours at a time, are all increased difficulties.

The amount of food allowed by a food stamp is a purely mathematical quantity. It is estimated on the average weight of the nation; often those under weight receive too much and those over weight too little nourishment. Families with children have a better chance of making a just distribution than people with only grown-up children or elderly people, who, as usually happens in old age, live alone. On the average a man fares worse than a woman. As the average weight of the nation is about 45 kg., persons weighing 60, 70, or 80 kg. are quite inadequately provided for.

The average person ingests daily food-stuffs containing 91 grams of nitrogen, from which are derived 2,569 calories. After deduction of loss there would be, according to the usual assumptions, about 2,362 calories

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and 73 grams of protein. In contrast with these figures, the uniform ration, as given for the winter of 1917, offers 1,344 calories and 30 grams of protein daily.

As to the degree of digestibility of the diet, this depends upon the nature of the food taken in, especially upon the kind of bread eaten, the vegetables and fruit. If a bread containing but little bran is eaten, the digestibility will be considered high. Losses in the diet of well-to-do persons may be kept down as low as 4 per cent; on the average, however, for a mixed diet they will rise as high as 8 per cent. In the war diet the losses have always been larger on account of the preponderance of bread that has not had much waste ground out of it, and vegetables, and on account of the lack of animal nourishment. Such losses amount to about 12 to 15 per cent. The case is just the same as regards the using up of nitrogen. With the mixed diet of peace times it may be as low as 10 per cent, but with the war diet it will increase to as much as 20.40,. even 50 per cent loss, according to the kinds of food. The indigestible war diet will, in the case of weak intestines and elderly persons or persons not accustomed to a voluminous diet, lead to greater losses. Therefore, if 1,344 calories are taken in, the diet is for the most part not meeting half the requirements as regards calories and one-third as regards protein; if 1,100 calories are taken in, perhaps four-tenths of the requirements as regards calories, even if one leaves utterly out of consideration the varying degrees of digestibility. Moreover, the number of calories cited was not by any means always attained; because above everything else, in the case of meat, no account is taken of the trimmings. In the case of bread very poor wares were issued, and butter and margarine were astonishingly rich in water-content.

The average weight of persons over twenty-five years of age may be set at 60 kg. Let us assume that the food supply offers on an average 1,000 calories, which in the case of the uniform ration is estimating it rather high on account of the waste in cooking, and we hardly need any further investigation to be assured that every hungry man needs more than 1,000 calories to restore what he loses of his own flesh and fat. From experience gained by experiments we know that a hungry man needs about 30 to 32 calories per kilogram if he stays in his room and moves about no more than is possible and customary under such circumstances, and that a hungry person weighing 60 kg. needs therefore 1,860 calories per day. If you are to give him this amount, he must have about 2,065 calories given in an easily digested diet. In this estimate, however, no account is taken of the nourishment which a human being needs if he is performing the average amount of labor, as assumed in the average of 2,569 calories above cited. The uniform

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ration of 1,000 calories, therefore, can by no means claim to meet the real needs, not even if a person were to lie idly in bed. When the diet is insufficient, the human being begins to lose from his body what is lacking in that diet, either fat from his fat-layer or protein. As the cells lose more and more of their content, perhaps both protein and fat are lost.

The human being can, as his body changes, arrive at a lower scale of weight and come to a new permanent condition. There is a limit to this; we know from experiments on animals, old and young, that starvation ensues when a creature that has previously been normally nourished reaches about one-half of its former weight. One can exist on the lowest scale of life if his nourishment is just sufficient to maintain his body reduced to about six-tenths of its former mass. One thousand calories will not suffice in the long run to avert starvation, and the protein in this diet would also be insufficient to prevent death. One thousand calories represent only the needs of a child 2 or 3 years of age.

Statements are frequently made in the press and elsewhere that the peace-time diet was too abundant and that the people are accustoming themselves to smaller quantities of food without any change in the body, and perhaps with an increase in its efficiency. In opposition to these ideas it can be shown that considerable losses of weight have occurred everywhere. The larger quantity of nourishment was therefore no luxury, for it nourished a heavier body. Whether this latter was necessary or not is a question to be settled upon its own merits. However, these observers seem to have paid no attention whatever to the fact that, with somatic changes, functional efficiency has also decreased. Any increase in efficiency is seen only in those who were formerly obese when they have lost the proper amount of weight. The idea of suddenly adapting oneself by "habit" to half one's former diet, without any somatic or functional change, cannot stand inspection. It is, as we see it in its present form, the product of inaccurate observation. The city population have avoided the consequences of the diminution of the rationed diet to 1,000 and 1,300 calories by preventing a part of its effects by legal and illegal additions, and have balanced a part also by the loss of flesh and fat from their own bodies. If, therefore, part of the population have gotten along with the uniform ration, they have succeeded in doing so in spite of the rationing system, because, fortunately, additional supplies in greater or less abundance were procurable.

The first effect of the insufficient diet is, above all, in the case of workers doing muscular work, the lessening of efficiency and changes of functional activity. This is evidenced by the fact that fatigue is felt more quickly than before. If there is shortage of nourishment first

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of all, the love of roaming about and of sport is lost; children cease to play; the desire to move about finally sinks so low, if the fatigue persists, that the person avoids, as far as possible, all bodily exertion. How far such effects make themselves felt depends upon the individual's mood; if it is a matter of efforts which must be made for only a certain number of days in order to accomplish a definite result, one overcomes the feeling of fatigue, as does the soldier who advances by magnificent forced marches in anticipation of victory, but this is quite a different matter with the dull, monotonous grind of one's daily trade.

The same is true as regards mental work. When the diet is insufficient, energy and delight in action, initiative, and will grow feeble; the impulses that under other conditions increase the assimilation, and of themselves assist in creating muscular energy, disappear; as the mood because more and more depressed, movements become slow and listless.

Physical decay as the result of under-nourishment manifests itself in the form of loss of fat, which on its side, if carried too far, increases the loss of protein, or from the very beginning in the decrease of protein in the body. If the emaciation has once progressed very far, it is extremely difficult to maintain the balance even with great quantities of protein. This is often shown nowadays in the case of persons worn out and emaciated until they are almost skeletons, and who frequently cannot maintain themselves with 100 grams of protein a day. The most important feature is, of course, the loss of protein, because the cells lose more and more of their content, that is, their efficiency. Yet, if the will is vigorously exerted in the case of persons who are badly run down, we often see them accomplish tasks which under any circumstances would be very fatiguing. Inasmuch as all the organs gradually grow smaller, the muscles grow thin and flabby, the intestines prolapse, the liver, spleen, thyroid gland, kidneys, etc., decrease in size, it is quite comprehensible that the body can no longer be considered healthy; it is undernourished and for the most part very anemic. Associated with anemia is the tendency to sweat if one makes the slightest exertion, and the sensation of cold in a temperature that leaves the normal human being unaffected.

As concerns the sensation of hunger, if a person has a too-abundant fat layer, he can grow thinner and get along indefinitely with less food without the sensation of hunger being permanently heightened. If the weight passes beyond a certain limit, about 10 to 15 per cent, one cannot entirely master the feeling of hunger. It arises at unusual times and long before the ordinary hours for meals, finally becomes real torture, and occupies one's thoughts continually. People complain constantly of hunger and try in all ways to procure more food.

Two other phenomena should be added to this picture. It is a well-

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established fact that a one-sided diet containing starchy food leads to an increase of weight through water. This may be observed on a very wide scale in the case of numbers of persons; change in the diet then brings about precipitation of water in the form of urine. Or the phenomena may develop into edema or dropsy, as was observed formerly in prisons. The worn-out body becomes feeble, loses its immunity to many diseases, and has a tendency to succumb to many forms of sickness. In the more favorable mortality statistics of the well-to-do classes in peace time the diet has always been considered to be the most decisive factor.

Experiments and observations of the phenomena now appearing lead us to believe that the body finally, in order to prevent its own ruin, can impose upon itself great limitations in the matter of renewing its organs. This expresses itself in vegetating upon a very low scale of nitrogen-balance, with simultaneous limitations of important functions of the protein, especially limitation of the formation of new blood, of the reconstruction of tissues, or of difficulty in the healing of wounds. In women there is retardation of menstruation and danger of injury to development or of a weakening in the strength of the ovum. In men there is enfeeblement of the testicles and spermatogenesis. The glands atrophy and probably the internal secretions are decreased. The influence of the foregoing on the development of our growing youth must be given particular attention.

These observations and considerations justify the cautious attitude shown by many physiologists from the very beginning in relation to the attempt to reach, as the ideal of national nourishment, an extensive diminution of protein-stuffs in the diet.

In attempting to explain the tremendous disproportion existing between a rationed diet and the real requirements of nourishment for a population, as these requirements existed before the war, the supplies of unrationed food and other additional nourishment which is scattered and impossible to estimate, may be left out of the question. The important question to be answered is whether the general basis upon which the average nourishment requirements have been reckoned has not been changed in the course of the war.

Adaptation to decrease the diet without injury to the health has taken place:

1. Through elimination of the soldiers, by which the average weight of the civilian population has been decreased by about 9 per cent.

2. Through the diminution, arising from the same cause, in the number of vigorous workers with high-nourishment requirements, and the preponderance of the feminine element with lesser efficiency and lesser nourishment requirements.

3. Through the suspension of many industries requiring severe

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labor, because of which the workmen had to transfer to other positions, in so far as they were not called to the colors.

We might well estimate the decreases in nourishment arising from these three influences at 1.20 per cent. Then it can be assumed that instead of 2,569 calories we could get along with 2,055 calories per person. In addition, however, we have to consider the injurious effects of the insufficient diet. These effects may be summarized as follows: Decrease in the population, for it can be shown as regards the diet of the very hard workers that the standard ration is not at all sufficient to enable them to accomplish what is demanded in industry in the case of severe labor; restrictions put upon personal activities; the change in city life in general; the prevention of the night life and of the restaurant industry; compulsory unemployment because of lack of illumination (petroleum); the possibility of the sudden liquidation of business houses, etc. Everywhere in a thousand petty details are seen the restrictions put upon work; even the business hours are shortened because of shortage of wares. The growth of the munitions and armament industry has removed these workers from the general food ration system, as they are provided with special rations.

The decrease in the bodily weight causes, through the diminution of the mass to be nourished, a great falling off in the demands made upon the diet.

An average decrease of 10 to 15 per cent in the bodily weight of the city population is certainly a low estimate. If we estimate the decrease in the work because of lack of nourishment as equal to 5 to 10 per cent of the nourishment requirements and again use the lesser estimate, we arrive at the conclusion that 15 per cent has been saved in the diet of the population as at present constituted. It is therefore conceivable that persons more than twenty-five years of age should get along with 1,800 calories per head per day, provided the distribution were handled in a rational manner. Weight may have fallen on the average to about 49 kg. (from 60 kg.). This has not, of course, been evenly distributed among all persons, but has taken place especially among larger people with a correspondingly high body weight. Their efficiency and their nourishment requirements must have decreased tremendously.

The population, functionally and somatically reduced, can then, as we see from the above physiological considerations, get along with nutritive values that vary to an extraordinary extent from the nourishment necessary for the well-nourished worker, who is usually carelessly taken as the example for such comparisons.

In order to piece out the uniform ration so that it may reach the rate cited above, no great amount of additional food is necessary.

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However, the population, with the object of maintaining itself, an object that is being less and less assured by the governmental system, which, too, is by no means improving the diet, attempts to secure further food supplies from the country and to a certain extent does succeed in so doing. Unfortunately, however, this in general is not the case, and the failure of the rationing system is constantly making itself more and more strongly felt.

It is, however, possible without great difficulty to bring the rations of the city dwellers to such a point that they will meet the general requirements of a sufficient diet. Both as regards quantity and quality, a better balance between city and country is quite possible.

The early reports of the healthful results of the uniform ration, of the loss of weight, and of the disappearance of all digestive troubles, have not been borne out by later investigations. The many articles published by doctors referred to individual cases many of which, when more closely examined, gave quite other results than the ones announced in the published statements. If these articles were written with the idea of reassuring the population regarding the existing evils, they failed in their purpose. When it is a matter of food shortage and restrictions, each individual is the best judge of his condition. The fear of letting our enemies know where there were several weak spots in our armament was very widespread but very ill-founded, inasmuch as "food-espionage," if one may use the term, was practiced through experts and on a very extensive scale by the embassy of a country that later went over to our enemies. This same espionage is still being practiced today through neutral countries.

(*To be continued*)

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MEDICAL WORK IN THE BRITISH ARMIES IN FRANCE[1]

By GEORGE CHEEVER SHATTUCK, M.D.

(With one illustration)

ORGANIZATION

IT WILL be of interest, I think, to consider the important types of hospitals which were used by the British in France and to outline the plan for handling patients.

The hospitals in question were of three principal classes, namely, the "Field Ambulance," the "Casualty Clearing Station" and the "General Hospital."

The Field Ambulance.—A field ambulance war attached to every fighting division in the field. When the division went into the line the field ambulance established itself within reach, and when the division was withdrawn for rest its Field Ambulance retired with it. The functions of the ambulance were to collect the wounded from the regimental aid posts and, when necessary, from the field, to put on dressings and splints, stop hemorrhage and evacuate the cases with the least possible delay to the Casualty Clearing Stations in the rear, where most of the operating was done. The wounded were collected by stretcher-bearers and evacuated by ambulance cars. When "in rest," or when there was no fighting, these units treated the milder cases of sickness which could be cured and returned to duty in a short time.

A hospital of this kind is of necessity small and capable of moving all its equipment in a few hours. It needs few surgeons, but requires a relatively large number of stretcher-bearers.

The Casualty Clearing Station.—Next we have the Casualty Clearing Station or "C. C. S." at railhead receiving cases from the Field Ambulances. A Clearing Station can ordinarily accommodate 500 cases and has facilities for expansion to 1,000. Every army at the front had a number of these units belonging to it. They moved with it when necessary, but moves were not frequent during the period of trench warfare.

The "C. C. S.'s" were generally grouped in the neighborhood of a town but not in it, because towns were much more subject to air raids and shelling than was the surrounding country. Consequently, permanent buildings were seldom available.

The "C. C. S." was intended originally to be an essentially mobile unit, but in the long period of trench warfare the necessity of early

[1] Service at No. 22 General Hospital, British Expeditionary Forces, as a member of the "Harvard Unit" in 1916, 1917 and 1918, and detached duty with casualty clearing stations in 1917 and 1918. Read before the American Climatological and Clinical Association, June 16, 1919.

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operating to prevent infection led to increased development, which resulted in diminished mobility. Much of the canvas was replaced by wooden huts, bacteriological laboratories and radiologists became attached, nurses appeared in the wards, and nurses trained in anesthetics released officers for other work. For a long time the physician, as such, had no recognized place in a "C. C. S.," but in the Second Army, at least, physicians were later appointed for all of these units.

General Hospitals.—The large hospitals to which the clearing stations evacuated their sick and wounded were called "General Hospitals." These were on the coast, some in towns where they occupied permanent buildings, and others in open country where huts and tents were erected for their use. Patients came to them by ambulance car from the Hospital Train. The principal avenues for evacuation were the "Convalescent Camps" in France and the "Hospital Ships" for England.

The capacity of most of the General Hospitals was increased several times during the war and finally reached 2,400, comprising about 1,400 permanent beds and roughly 1,000 stretchers or bed sacks.

Work of a General Hospital.—No. "Twenty-two General Hospital" at which the "Harvard Unit" served, and to which I belonged, was provided by the Unit with physicians, surgeons and nurses from America. All the administrative officers were British until Lieut. Colonel Cabot took over the command. The Noncommissioned Staff and the men remained British. Like other general hospitals it had two divisions, surgical and medical, between which ward accommodation was shared in fluctuating proportion according to need.

The "establishment" of a General Hospital included thirty-two officers. The duties of three of them were purely administrative, viz., the Officer Commanding, the Registrar and the Quartermaster. The Chiefs of the Medical and Surgical Divisions were responsible in a general way for the management of their Divisions and took part in clinical work as well. The rest of the clinical work was done by officers assigned to one Division or the other, each officer taking charge of a number of wards. There was an officer in charge of the Clinical Laboratory and another of the X-ray Laboratory.

The number of beds that a physician could look after depended partly on the type of cases he received and the rate at which they were being admitted, but even more on his experience. If he could not keep ahead of the work, evacuations were delayed and beds which should have been vacant remained occupied. Moreover, in busy times the absolutely necessary work increased out of proportion to the admissions, because prompt evacuation became imperative. At such times

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the man of experience could do more than two not familiar with work of this kind.

Two wards of 60 beds each, with from 10 to 20 new patients a day, were found to be more than a new man could handle efficiently. He could examine and treat them, but could not dispose of them promptly, whereas the same man a few months later could learn to handle twice that number of stretcher cases or a much larger number of walking cases.

In 1917 and 1918 the number of officers on duty at No. 22 was at all times below the authorized establishment and generally far below it all available officers having been detached for temporary duty with hospitals even more depleted than our own. More and more medical officers had to be sent from the bases to fill vacancies in the forward areas so that, in the last year of the war, shortage of medical officers at the General Hospitals became acute. During this period, with a Staff smaller than at any previous time, our hospital did its largest amount of work.

The principal factors making for efficiency were, I believe, the following: Firstly, the officers had learned every detail of their work; secondly, ward routine and laboratory work were systematically reduced to lowest terms; thirdly, the nurses learned to be very helpful; and lastly, the British officers and personnel coöperated with fine spirit.

The Medical Division.—A rough idea of the work of the medical division can be gained from the accompanying Table I, showing numbers of patients admitted to the Division and their disposal during the month of February, 1918. At that season of the year the Medical Division handled only medical cases in the civil sense.

"Paper work" was, I believe, simpler than in the American Army, but, nevertheless, took a considerable proportion of time when patients were passing through the hospital in large numbers. Many of the forms were prepared by clerks in the divisional offices and from there distributed to the wards for completion. Volunteer clerks from among the convalescents were invaluable in the wards for walking cases, With their help a medical officer could look after a much larger number of patients. In the other wards the nurses and their aids helped also in this work. No patient could be evacuated until the required papers had been completed and signed by the officer in charge of the ward.

To sift and rapidly to dispose of patients was the prime necessity of busy times, and medication became largely a matter of routine.

When there was pressure for beds, patients were evacuated as soon as fit to travel, and in these circumstances a large proportion went to England, but in quiet times when they could remain a week or two in the hospital the great majority of sick were evacuated to Convalescent

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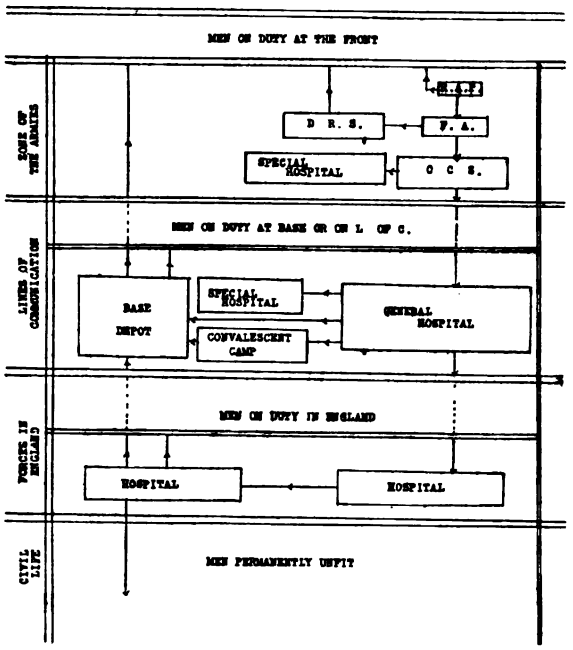
Camp, from which they passed when fit for duty to the Base Depot.

A few, who recovered while with us, went directly to Base Depot for duty, and the partially disabled or permanently unfit were boarded there for reclassification or discharge from the army.

Contagious diseases were isolated and promptly transferred by ambulance to a hospital designated for their care. Similar special assignments were made for enteric, dysentery, so called "shell-shock," mental disease, and venereal disease. Special labels were required for cases of organic and others for functional nervous diseases destined for England, so that the patients would be sent directly to certain hospitals there. Diagram I shows the main lines of evacuation and some of the subsidiary circuits.

DIAGRAM I



The line of evacuation is indicated by arrows pointing down, transfers to subsidiary hospitals by arrows pointing to the left, and return to duty by arrows pointing upward.

The patients arrived in convoys of from 50 to 500 at a time, and rarely 800 or more were admitted in a single day. They had to be fed, washed, clothed when necessary, classified, catalogued, and redistributed through many channels.

Two military aims were never lost sight of: Firstly, to have at all times enough vacant beds to accommodate a convoy; secondly, to hold

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in France for return to duty every man who would be fit for it within the time during which he could be kept in hospital or at convalescent camp. The first of these needs took precedence over the second, and the interest of the individual yielded to both.

It is here that military medicine most sharply differs from civil practice. War requires sacrifice of the individual whenever such sacrifice may contribute to success or to the interest of greater numbers, and this is the lesson which we found the hardest to learn. When patients stayed in the hospital long enough to become known as individuals it was hard to deny them the chance of going to England to convalesce, the more so because home leave for the private soldier could only be provided at long intervals. To write "C. C." or "B. D." on the card of a man who had been long from home, and who would soon again return to the trenches, seemed like imposing sentence upon him because he had not had the good fortune to be seriously ill or to receive a severe wound. After the first two years of war, "Blighty" seemed heaven to the men, and a severe wound a small price for the privilege of going there. One fellow, typical of many, with a ragged wound which laid open the deltoid of his right arm, told me with delight that the doctor "up the line" had said it was "a sure Blighty" and had added that he would give five pounds for one like it.

When convoys were being admitted the strictly medical cases were assigned to wards reserved for their care. When the surgical division became crowded, border-line cases, such as trench feet, went to the medical wards, and vice versa. When a battle was expected the medical cases remaining in hospital would be concentrated in a few wards, and half, or even more, of the medical division equipped to handle wounded. The physicians remained in charge of their wards at such times, for the surgeons had enough to do looking after their own wards and doing the operating. The physicians selected, and sent promptly to the theater, cases urgently requiring operation. Doubtful cases were seen by a surgeon.

When, during the summer of 1916, a large number of cases of chest-wound were admitted, and the physicians were consulted about them, it was soon found that a considerable proportion of these cases did well without operation, and that others required study for which the surgeon had no time. Chest-wounds in our hospital were thereafter admitted direct to one of the medical wards. The same practice was followed at other General Hospitals.

Diagnosis.—The Field Ambulances made abundant use of conventional terms in lieu of diagnoses. For example, "P. U. O.," meaning "pyrexia of unknown origin," stood for various kinds of fever; "N. Y.

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D." for "not yet diagnosed"; "Myalgia" indicated pain without obvious cause; "V. D. H." valvular disease of any kind; "D. A. H." "disordered action of the heart" without gross lesion; and "I. C. T.," or "inflammation of connective tissue," included a wide range of minor inflammatory processes.

This system enabled the Field Ambulance rapidly to pass along minor ailments without dealy. The Casualty Clearing Stations and other hospitals farther down were ordered to replace the conventional letters by diagnoses of a definite character.

Cases of serious illness were definitely diagnosed "up the line" and were held as long as necessary at the "C. C. S."

The Casualty Clearing Station or "C. C. S."—The "C. C. S." was generally one of several which received in turn for twenty-four hours consecutively on every second or third day during quiet or "peace times," as they were called. At such times most of the patients were "sick" so that many could be returned to duty within a week.

When fighting was heavy the system changed to one in which cases were received until 200, or some other number previously agreed upon, had been counted. Subsequent arrivals were then directed to the "C. C. S." which had taken over the admitting until they had received their quota, and so on in turn. For making up the quota, the stretcher case was the unit and was counted as one, but the walking cases counted only half as much. For example, the quota of 200 might be made up of 100 stretcher cases and 200 walking cases, or of 150 stretcher cases and 100 walkers.

The walking wounded were redressed and nearly all marked for evacuation at the earliest opportunity. The stretcher cases were examined and classified. Those fit to travel and not urgently in need of operation were sent to the evacuation wards. Patients in bad condition were put in the resuscitation ward, where an officer skilled in transfusion of blood took charge of them. Wounds of the chest were sent to the chest ward, gassed patients to their special wards, and the sick to theirs.

Cases urgently in need of operation, whether officers or men, went to the preoperation ward, those needing X-ray having been so marked. There, lying on the stretcher often in muddy, blood-stained uniforms, they awaited their turn.

In this ward one saw most clearly the calm, patient courage of the British "Tommy." He rarely asked for anything except water. He never inquired the nature of his wound, his chance of recovery, or what would be done. When carried into the theater his face showed relief, but no anxiety. If a leg needed amputation he assented without demur

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or emotion. His thoughts were at home in "Blighty," and he expected to get there.

Amid such surroundings one might ask: What can a physician do? The question was answered by experience. At first there were no physicians recognized as such at the Clearing Stations. They were acting as anesthetists. This arrangement was not ideal, because, even when there was fighting, varying numbers of seriously sick were received and gassed cases were sometimes very numerous. These two groups of cases could not be satisfactorily dealt with by a man whose first duty was to give anesthetics, and, moreover, the shortage of medical officers became steadily more serious.

In the last year of the war, nurses were giving the anesthetics, and physicians had been appointed to take charge not only of the sick and gassed cases but also of the chest-wounds in the clearing stations of the Second Army (Table II). Other physicians had been trained as radiologists, some were taking the place of surgeons by rendering efficient service in the receiving ward, and others were taking charge of resuscitation and doing blood-transfusion.

When the influenza epidemic was at its height the battle casualties were light in many parts of the line, but the medical work was so heavy that the surgeons, at times, took part in it. These conditions were exceptional and transitory, but the plan of having a skilled physician on the Staff of the Clearing Station worked well under conditions of all sorts. When, as was occasionally possible, a second physician could be found to take charge of the resuscitation ward or to help with the medical work, it was a great advantage.

Diseases.—The commonest febrile disease in 1916 and 1917 was trench fever, but in 1918 influenza was epidemic and trench fever less frequent than before. The first cases of influenza that I saw in the spring of 1918 were very mild and returned to duty after a few days. In July the disease became more severe, bronchitis was often observed, and occasionally broncho-pneumonia, but I saw no deaths until the autumn, when broncho-pneumonia became not only common but severe and the death rate high.

There was dysentery of the Shiga type in Belgium in 1917, but in 1918 that of Flexner predominated. In both years there was a good deal of afebrile "dysentery" of short duration, the stools showing blood and mucus for a few days and then returning rapidly to normal. Repeated bacteriological examinations having failed to show any more likely organism, the enterococcus was suspected.

Between August and October of 1917 near Poperinghe in Belgium I saw a good many cases of gastro-enteritis. The first cases complained

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chiefly of vomiting and a few seemed dangerously ill, but all recovered. They had little or no diarrhea. The type then changed to one in which abdominal pain predominated, and there was occasionally vomiting or diarrhea. About a dozen of these patients which arrived about the same time had on the "Field Ambulance Cards" the diagnosis "Query Appendicitis." In subsequent cases diarrhea with dysenteric stools became the rule. Most of the patients were afebrile and had negative stool-cultures, but among them were a few with fever and in most of these the Shiga bacillus was found.

Typhoid fever in my experience was extremely rare. I saw but one typical case in more than two years of work, and the patient recovered after running the usual course of fever. Paratyphoid was not rare, but we saw surprisingly little of it. Again and again patients who were having a run of fever suggesting mild typhoid were examined bacteriologically with negative results and sent, nevertheless, to the Isolation Hospital as typhoid suspects. Nearly always the diagnosis returned by the Isolation Hospital was trench fever. In the few exceptions it was paratyphoid.

The atropine test of Marris was tried on a large series of cases, including many controls and discarded as misleading and practically valueless. The Widal in men who have been inoculated is little better. The Dreyer method, I believe, has some value provided the suspect can be isolated during the period of a week or more during which the series of agglutination tests is being made, but, when the question was whether or not to transfer at once to a special hospital as a typhoid suspect, it was necessary to use quicker methods. Blood and stool cultures answered best, and agglutination in unusually high dilution was regarded as sufficient evidence for isolation.

Contagious diseases were few, both at the Clearing Stations and at the Base. Suspicious throats were always cultured, but generally proved not to be diphtheria but Vincent's angina, of which there was a good deal.

Few cases of meningitis were seen. One young fellow with slight fever had symptoms of hysterical origin simulatng meningitis. Later it was learned that he had had meningitis five years before.

There was a small but interesting group of cases of infectious polyneuritis. Later cases, very similar, showed evidence of lesions of the cord.

Most of the "myalgias" seemed to be trench fever with leg pains, in an afebrile period. There was also a noteworthy number of cases of sciatica often traceable to the sacro-iliac joint. Rheumatic fever was astonishingly rare. A few cases only were seen, and these were subacute.

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The "trench nephritis" was interesting in that dyspnea, when marching with equipment, was often the first symptom noted by the patient. It was soon followed by swelling of the legs. The symptoms often increased gradually for a week or two before the man reported to the doctor. Whether or not infection plays a part in the etiology, seasonal fluctuation was observed in three successive years. Nephritis was common in the spring. When warm summer weather had become established, typical cases became scarce. They reappeared in the autumn and early winter after a month or two of cold and wet. This experience points to exposure as an important factor in the production of most cases of war nephritis. Death from nephritis was rare.

To discuss the injuries from gas, the functional nervous disorders, and the chest-wounds would exceed the scope of this paper.

I wish at this time to express gratitude to Lieut. Colonel Cabot under whom I served and to others who helped or encouraged my work.

TABLE I.—*Medical Division.* (Month of February, 1918)

Remaining from last month	Admissions February	Died	To England	C. C.[1]	B. D.[2]	Transferred	Remaining in hospital
988	1591	1	470 18.1%	977 41.4%	246 9.5%	91	794

[1] Convalescent Camp. [2] "Base Depot" for return to duty.

TABLE II.—*Analysis of Chest Work of a "C. C. S." in the Autumn of 1917, Near Poperinghe*

Dates: September 23 to 29, 1917, inclusive

Operated cases: Total 19	*Evacuated to base*	*Died at C. C. S.*
1. Parietal wounds only	5	0
2. Open pneumothorax	2	2
3. "Uninfected" hemothorax	5	0
4. Foreign body removed from pleura	1	0
5. Established infection	3	1
	16 (84.2%)	3 (15.7%
Cases not operated on: Total 51.		
Of these sent to base	46	
Unfit for operation and died at C. C. S.	5	
Total of all cases	70	

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A BASE HOSPITAL POST-GRADUATE COURSE

By Major C. F. TENNEY
Medical Corps, United States Army

ALL medical officers, devoted to the progress of medical science should be interested in the recent article published in the J. A. M. A. May 24, 1919, by Lieut. Colonel Foster, entitled "Medical Education as Revealed by the War." In this article, those intimately in touch with the problem will read a just and sincere criticism of our present-day methods in some schools. The purpose of the paper, no doubt, was to present clearly the conditions as found and diagnosed by a careful observer. To tear down, if necessary, the old forms of medical training and education and to open up the possibilities of further exploration and experimentation is perhaps the object of the article. We believe, however, that the author has said nothing which all have not been thinking of, with a long-suppressed desire to prove. Seriously considered, the article is revolutionary and awakening. It may, let us hope, mark a new era in the study and growth of medicine.

We who are still in the service, perplexed by this very comprehensible difficulty, have tried to find the solution. In the medical service of the base hospital at Camp Upton, we have been for some time experimenting with a solvent. Frankly, our solvent is composed of no new fundamental elements, no new properties, but simply is endowed with a new recognition and an open field for investigation. It is almost the score old application of professional education principles as stated by such an eminent educator as Professor Dewey of Columbia University and just now beginning to find recognition in the medical world.

In order to overcome some of the abstract results of medical schooling, to quiet the feeling of dissatisfaction, to stimulate the kind of professional work desirable, and in general to develop and broaden the study of internal medicine, an extensive program for the realization of such ideals has been put into execution. The chronic enemy of new ideas always comes forth with these juvenile questions: "Why an extensive program?" "Didn't things run all right before?" "Does your new plan have any effect on the mortality rate?" We have nothing to say to these questions. We desire to be sympathetic, courteous and indulgent. But in conclusion we might say that Lieut. Colonel Foster's article is sufficient proof of the necessity of doing something definite. So we had thought it wise, in accordance with undeniable facts plain to us some time ago, to start a post-graduate medical course with practical instruction, a medical library in close proximity to the Medical Service Office, a

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statistical and research department to promote and encourage coöperation and individual expression among the officers, following this up with personal instruction and advice wherever necessary. In brief we will outline the courses as we are carrying them out.

1. *A clinic* to which all medical officers of the base hospital are required to be present is held in the Red Cross Building every Wednesday evening. Three or four papers with demonstration of cases are presented. In so far as possible one department presents the entire program for the evening. This is followed by examination of the cases and general discussion. Many lantern-slide demonstrations have been given, pathological specimens demonstrated, and with the large variety of clinical material at hand much interest has been shown. Nobody will deny the fact that the life of any doctor in the service is somewhat foreign to his former existence. We have decided that the best way to solve this problem would be to invite discharged medical officers to give us an evening on their work in civil practice. In other words, we are trying to desensitize our men to the conditions they must expect to meet on their return home.

2. *Ward walks* are held in the various wards of the service on Tuesdays and Thursdays between 11 and 12 noon. Each ward surgeon selects two or three carefully worked-up cases to be shown on the date that the service visits his ward. The courses of instruction in the wards are made as practical and as intimate as possible. We have found, as Lieut. Colonel Foster stated, that many of our men are ignorant of the lumbar puncture. At one of the ward walks a meningitis case was presented and the method of serum administration demonstrated. To follow up the object of this demonstration every officer has been assigned to this form of work, giving him an opportunity to try out and perfect his own technique under the most careful instruction. In other words, we are trying hard to strike what we know to be the keystone of success in medical diagnosis, the happy harmonization of theory and practice.

Ward walks of great value have been held in the pneumonia wards, many cases presented, histories reviewed and personal examinations made by each surgeon present. Differential diagnosis and the many complications were discussed with relation to all pulmonary diseases. At another time a case of tuberculosis was presented to our staff in the tuberculosis ward. The ward surgeon was the instructor and had worked up the case well. This was his opportunity to show the kind of work he was doing. He was intelligent and appreciated the situation. What is the worth of all the combned medical knowledge of the world, pent up in one man, if he has no outlet for expression? First, the history of the tuberculosis patient was read and then commented upon

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by all present. Second, the patient was examined by all and the physical findings discussed. Third, the X-ray plates were shown and the aids and limitations of this method of diagnosis fully explained Fourth, the sputum smear, typical of a positive case of pulmonary tuberculosis, was examined. Fifth, the disposition of the case was considered. This in turn led the way to a further discussion on the disposition and segregation of all pulmonary cases, the advantage of an early diagnosis, the isolation of positive cases for the safety of the community, and the early separation of either positive or suspicious cases from a poor environment.

3. *The Pathological and X-Ray Laboratories.*—Officers are assigned to these laboratories on Mondays, Wednesdays and Fridays from 11 to 12 noon. They have here the opportunity of reviewing laboratory work, of observing the use of the X-ray and studying new methods and technique. The officers are allowed free access to these laboratories to come and go as they please and to carry out any special or research work under the guidance of those in charge. The contribution that these laboratories are making to the entire scheme is important and may well be appreciated by all connected with the service.

4. *The Medical Service Conference* is held on Friday afternoons from two to three o'clock. The ward surgeons talk over the many difficulties arising in ward management and, if necessary, the professional care of their patients. At this time complaints and suggestions are considered. The service, by means of open talks, tries to alleviate the dangerous and undermining power of undertone criticism. Outside of this general conference, three short papers by officers of the medical service are scheduled for each meeting. The object of these papers is to review thoroughly important medical subjects. At a recent conference the entire subject of malaria was taken up, first by a review of the past experience with the disease, the method of diagnosis and treatment; second, by the examination of two cases, followed by short talks on their histories; third, the laboratory end of the subject in which the method of smear taking was shown and a microscopical examination made by each officer. Certainly no course of instruction could be more advantageous to the individual. At another conference gastric lavage was performed, and the stomach contents were analyzed in their presence. The comparison of the two cases examined with the normal helped to fix in their minds again what a gastric content should reveal to be normal.

5. All *autopsies* are required to be attended by all medical officers. There the history of the case is read, and the officers become familiar with the gross pathology of the case. Later, as soon as the specimens

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are ready for demonstration at the laboratory, the officers report for a microscopic review of the case.

6. *Rotary Service.*—The ward service is so arranged that the men spend only a certain amount of time doing a certain class of work. They are then transferred to another ward, a change of service being thus maintained. However, men especially fitted in certain lines of work, such as chest, kidney or gastro-intestinal, are the supervisors of that work and aid in the instruction of others.

7. *Lectures.*—Officers adapted for giving lecture courses are called upon to give the different lectures on medical subjects as outlined in the curriculum of work for the training school for nurses carried on in connection with the hospital.

8. *Ward Schools.*—Ward surgeons are constantly reminded that in certain senses their wards are to be regarded as small schools and that they are to devote their attention to the instruction of their ward assistants, with especial reference to the student nurses and wardmen, the latter to be given individual instruction in first aid work.

9. *Medical Library.*—As a privilege to all officers of the hospital a medical library has been established in connection with the service. Medical journals, reprints and recent books have been selected with great care. In this we are greatly indebted to the assistance of the hospital representative of the American Library Association, who has obtained many needed books and other literature for us. It has been the object in the selection of reading matter not only to obtain books dealing with well-known medical subjects but also, if possible, to present the various fields open for medical and pathological research and to touch on the broad character of the community life to which the officer must needs return. By making this library available for surgical, laboratory and medical men alike, it is expected that the lack of coöperation and irritating differences that arise between different departments as the result of separation and over specialization will now be eliminated. It is hoped that the officers, in meeting together from all departments and services, may engage in interesting and instructive discussions and a greater hospital coöperation realized. And, finally, thus may be realized the ideal that the medical man will become somewhat surgical and the surgical man somewhat medical.

10. *A Clinical Research Statistical Department* has been established. Three points of prime importance should be cited in the development of this department: First, to encourage personal research work of each officer; second, to assist in the compilation and presentation of medical subjects; third, to have readily available, at all times, information of a more or less general nature. Some of the important general informa-

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tion included is the variety of diseases passing through the service, mortality percentages, complications and all possible data on the different classes of cases. A cross card index filing system has been in use for some time, making easily available all information on any particular line of cases. All charts of patients passing through our service go through our office prior to final filing in the registrar's office. Officers are encouraged in every way possible to do their work in joint coöperation with this department. How does this work out? For example, a certain ward surgeon was asked to present an article on Type 1 Pneumonias before one of our Wednesday night clinics. His first move toward the preparation of the subject was to get in touch with the statistical office. He stated his case and enlisted their aid. In a short time the information was ready. There was first of all a complete list of Type 1 cases, a series of ratios showing their relation to all other pneumonia cases, to other diseases and to the daily camp census. There was information, also, of an epidemiological character. There was information concerning serum treatment and laboratory findings, complications, X-ray reports and post-mortem examinations. Together with the department he worked out a graphical chart showing the temperature, pulse and respiration curve of typical cases. Could the officer have asked for any more coöperation and encouragement in the work he was doing?

What reaction does he experience? He soon becomes enthusiastic with the object of the department. Why? Because he knows that everybody, from the office assistant to the Chief of Service, is behind his problem. He has definite facts and information to utilize as raw material. When a captain of industry has at hand quantity and quality of raw material his business will not fail except for the lack of effort. So it is with our officers. They become greatly impressed with the idea that they are doing something that is worthy of all their efforts, something that, when done, will be complete and lasting.

In consideration of the fact that there is a certain amount of routine ward work it has not been found practical to introduce more courses than are listed above. The program has proven a success from many standpoints. The officers have almost forgotten to worry about their discharges and are doing better work. In conclusion, we have decided that the hospital is large enough, that the equipment is adequate, and that little was required but the proper method and spirit. With due consideration to theoretical requirements, our present results encourage us to believe that we have in part solved the problem as set forth by Lieut. Colonel Foster, at least as far as a military hospital is concerned.

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ORTHOPEDIC SERVICE IN THE BRITISH GENERAL HOSPITALS

By Lieutenant Colonel ROBERT B. OSGOOD

Medical Corps, United States Army

EXPERIENCE BEFORE AMERICA ENTERED THE WAR

A FAMILIARITY with the surgery of the present war was gained by certain American surgeons before America herself entered the war. Some of this familiarity came from service with the French, chiefly at the American ambulance at Neuilly, just outside of Paris, and at the small accessory hospitals at Jouilly conducted under the same auspices.

The services in these hospitals, beginning in January, 1917, were in most instances of short periods of three to six months, but almost concomitantly with these the British Government accepted the services of American units in certain of the general hospitals in France and in certain special hospitals in England. It became evident that a very large percentage of wounds, perhaps 70 per cent, would consist of lesions of the extremities. This meant that motor function would be threatened in a large proportion of these extremities. The previous civilian training of orthopedic surgeons more nearly fitted them to conserve and restore function in this class of lesions than the training of any other specialty. Convinced of the wisdom of medical preparedness, certain of the American physicians who had been working in the French and English hospitals began to agitate the question of forming American base hospital units. This agitation was given constructive form by Gen. Jefferson R. Kean, serving at this time in the American Red Cross.

ORGANIZATION OF AMERICAN BASE HOSPITAL UNITS

Under the aegis of the American Red Cross, these units were organized all over the country from the staffs of large hospitals and the faculties of the medical schools. At least one, and, in many instances, several orthopedic surgeons were enrolled in nearly all these base hospital units, and when in the spring of 1917 the British Government, through its Medical Department, asked the United States Medical Department for six base hospital units to take over six British general hospitals in France, the entire personnel and most of the equipment of the six were ready.

ORTHOPEDIC SURGEONS ATTACHED TO FIRST SIX BASE HOSPITAL UNITS

Each of these hospitals was organized under a director, and on each, with one exception, was an orthopedic surgeon.

The Lakeside hospital unit of Cleveland was organized with Maj. George W. Crile as director and Capt. Gordon Morrill as orthopedic

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surgeon. The director of the Harvard unit was Maj. Harvey Cushing, and Capt. Frank Ober was orthopedic surgeon. The director of the Washington University unit of St. Louis was Maj. Fred T. Murphy, and Capt. Nathaniel Allison was the orthopedic surgeon, with two assistants. The director of the Pennsylvania Hospital of Philadelphia was Maj. Richard Harte, and Capt. William J. Taylor was orthopedic surgeon. The director of the Presbyterian unit of New York was Dr. George W. Brewer, and Capt. Armitage Whitman was orthopedic surgeon. The director of the Chicago unit was Major Beasley, but no surgeon was assigned to this unit specifically as an orthopedic surgeon, although Captain Speed had devoted much attention to bone and joint surgery.

ASSIGNMENTS OF UNITS TO BRITISH GENERAL HOSPITALS IN FRANCE

Within a week of the arrival of these units in England, they were assigned to British general hospitals in France. No. 4, the Lakeside hospital unit, to General Hospital No. 10 at Rouen; No. 5, the Harvard unit, to General Hospital No. 11 at Dannes Camiers; No. 21, St. Louis, Washington University unit to General Hospital No. 12, at Rouen; No. 10, the Pennsylvania hospital unit, to General Hospital No. 16 at Le Treport; No. 2, the Presbyterian unit, New York, to General Hospital No. 1 at Etretat; No. 12, the Chicago and Northwestern unit, to General Hospital No. 18 at Dannes Camiers.

OUTLINE OF WORK IN THESE GENERAL HOSPITALS

The histories of these hospital units will be found elsewhere. It concerns us chiefly to describe the work of the orthopedic surgeons attached to these units. These hospitals were receiving cases through the British casualty clearing stations, which, in times of push, acted in many cases simply as dressing stations, and therefore many of the cases were received within twenty-four to forty-eight hours after they had been wounded.

In times of comparative quiet the cases usually remained two or three days in the casualty clearing stations, and definitive operations in the majority of the cases had already been performed. This made the surgery of the general hospitals, to which these units were assigned, very varied.

In times of push the surgery would be practically that of a casualty clearing station. In times of comparative quiet the surgery would be that of a base hospital. In many of these hospital units the orthopedic surgeon was given charge of the fractures and joint injuries, and, since the administration of the hospitals was under the British, all supplies were obtained through British depots.

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TYPES OF SPLINTS EMPLOYED IN BRITISH GENERAL HOSPITALS

The splints were British patterns and represented the result of a gradual simplification of methods which had been taking place during the course of the war. The evolution had been slow, and there were still nearly fifty different types of transport splints.

Plaster of Paris was rarely used, and the quality of the plaster of Paris bandages furnished by the British Government did not encourage their very general use. The American orthopedic surgeons had depended to a large extent, both in civil life and in their early war work, upon plaster bandages in the treatment of bone and joint conditions and simple fractures. These fractures, accompanied as they were by infected wounds, made its use difficult if not actually inadvisable, and they were thrown back on some form of open splints as the only practical method of meeting the conditions which required immobilization and free access to the wounds.

TREATMENT OF FRACTURES IN BRITISH GENERAL HOSPITALS

By the British plan, patients received in the general hospitals in France were expected to remain about two weeks, or until such time as their transport by hospital train and hospital boat to England could be safely undertaken without danger to their general condition, without risk of lighting up their infection, and without jeopardy to the position of the bones. In practice, however, it was soon found that many of the complicated infected fractures and joint injuries needed to remain a much longer time in the general hospitals in France before their transport to England was safe.

The mortality with the fractured thighs had been alarmingly high, and soon after the units arrived a general order was issued that no fractures of the femur should be sent to England until they were entirely healed. This enabled the cases of importance to be followed until the convalescent stage was reached and furnished an excellent opportunity for training these orthopedic surgeons in the typical and important bone and joint casualties of the war.

The use of the open fixative and traction splints, which were rather forced upon these surgeons in the English general hospitals, led them to respect the principles underlying these splints and enabled them to become familiar with their use, which familiarity bred enthusiasm. Thus, when the question of the American transport splints was raised, definite data were on hand—data based on experience covering several months.

The proportion of bone and joint casualties is always large, and in these English general hospitals, as has been said, many fractures—in

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several of them, all fractures—fell to the care of the orthopedic surgeon and his assistants. The joint injuries also proved of extreme interest and became orthopedic problems.

PRIME REQUISITES IN TREATMENT OF BONE AND JOINT CASUALTIES

Two things stood out above all others in the treatment of these bone and joint casualties—the necessity for immediate immobilization and the need for immediate operations. Immediate immobilization seemed to be an end possible of attainment and was actually accomplished in the United States Army. By placing the standard splints far forward in the battalion dressing stations and instituting a very thorough and universal splint drill in all the combat divisions, it was possible to immobilize these fractures and joint injuries almost as soon as they were received. Our stretcher-bearers were as brave as any, and the picture of one of these men, his arms full of splints, in the act of applying them to two wounded men in No Man's Land should be painted. All three were dead.

The second necessity is immediate operation, which is, of course, closely associated with the problem of splinting. Transport is infinitely expedited by proper immobilization. When the cases reached the general hospitals many of them had had, as we have said, definitive operations performed, but in times of push the bone and joint surgery became acute.

CLINICAL DATA

New conceptions of the resistance of the synovial membrane had to be formed. Joints which were received in a very precarious condition often quieted down under simple immobilization and traction. It became an important and difficult thing to decide when definitive operations should be undertaken in these cases received more than twenty-four hours after the original wound. Frequently the irritation and inflammation present when the patients were received was proved to be due to the trauma of transport. With foreign bodies existing in the joints, removal was simply a question of time, but that there was a question of time seemed proven by our experience. Noticing that many joints, in which the X-ray showed no foreign body, quieted down completely under efficient immobilization and traction, although they were extremely threatening on entrance, we began to watch a few selected cases in which foreign bodies were still present in the joints and in which an inflammatory reaction existed.

Under immobilization many of these joints quieted down as the others in which no foreign body was present had done, and we were able to choose a time for operation which seemed to offer less danger than an

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immediate operation on entrance would have offered. In other words, the time was chosen when the local signs of inflammation were subsiding and the resistance of the body to the invading organism was at its height.

We realize that this is heretical doctrine to teach, and with our modern methods of more perfect control of early sepsis it would undoubtedly be safer to adopt, as a working rule, the removal of all foreign bodies as soon as they were discovered to be within the joint cavity. The individual case might not perhaps attain as perfect function, but there ought to be no tragedies. Only almost hourly inspection of these cases would make it justifiable to follow these dilatory tactics.

The joint cavity was reached by the path of the missle, and the devitalized tissue was carefully dissected away along this track. Then, after as complete a mechanical and chemical sterilization of the path as possible had been accomplished, instruments and gloves were changed and the synovial cavity was opened, the foreign bodies removed, and the joint cavity thoroughly irrigated by means of a continuous stream of mild antiseptic or sterile salt solution running in through a soft rubber catheter passed into the deepest recesses of the joint. This irrigation lasted for ten to fifteen minutes and unless the infection gave evidence of being very virulent or if the disorganization of the joint were not great, the synovia was tightly closed with continuous catgut suture and a small drain inserted through the external wound running down to the synovia but not into the joint cavity. In cases where the infection was more extensive and severe than we had anticipated, the joint cavity was drained by lateral incisions, and occasionally by postero-lateral incisions, in order to reach the popliteal space. In these early days the value of the Dakin treatment was still *subjudice*, and, while we employed it with great satisfaction in certain cases, it had not become the routine treatment in all.

It would probably be safer at the present day, as we have said, to advise the removal of all foreign bodies in joint cavities at the earliest possible moment, and if this earliest possible moment were more than twenty-four hours after the reception of the wound and the infection was well established, to advise also, the institution of the Dakin-Carrel treatment at once, or treatment after the methods of Willems. The joints in which the Dakin-Carrel treatment has been used will in a very large number of cases become ankylosed, but even this untoward result brought about by treatment is sometimes the only result which one must expect after the subsidence of a severe joint infection, and severe joint infections without this treatment often risk the life of the patient.

These more or less clinical data are inserted in this historical review

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to indicate the importance of the training which the orthopedic surgeons received at the British general hospitals. The training gave them experience in the treatment of this important class of cases, and played a part in the final standardization of splints for the Medical Department of the United States Army.

The cases in which these splints were employed and which were sent to England to the home hospitals were followed by means of reply postals. It soon became evident that transport was well borne if these splints, which combined fixation and traction, had been well applied.

Two of the orthopedic surgeons assigned to the English general hospitals later became assistant directors and finally consultants for the Division of Orthopedic Surgery, A. E. F.

We are aware of no other experience which could have proven of so great a value in training men to care for our own bone and joint casualties or could have given these men a broader point of view of war surgery in general.

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A REPORT OF THE INTENSIVE ANTI-TYPHOID CAMPAIGN IN SOUTHWESTERN GERMANY, INCLUDING AN ANALYSIS OF DATA ON SEVENTY-ONE TYPHOID CARRIERS UNDER OBSERVATION BY THE LABORATORY AT TRIER, GERMANY.

By Major PAUL A. SCHULE
Medical Corps, United States Army

(Concluded)

Origin of new cases of typhoid fever.—During the campaign a special effort was made to determine the exact or probable origin of new cases of typhoid fever. In the whole area, during seven years, 10,149 cases were reported and the source of the virus was successfully determined in 5,589, or 58.2 per cent for the whole. But there was considerable variation in the percentage of successful determinations at the different institutes, one laboratory succeeding in tracing the origin in 77 per cent of cases, another laboratory in only 30 per cent. This variation is due, partly, at least, to differences in the opinion of individual observers as to what constitutes "proved origin."

It is worth while quoting the report that in the above 5,889 cases, infection was reported as caused by—

1.	Contact	in	4,202 cases (71%)
2.	Water	in	399 cases
3.	Milk	in	309 cases
4.	Food	in	141 cases
5.	Dirty linen	in	39 cases
6.	Nursing	in	108 cases
7.	Soil	in	5 cases
8.	Manure and privy vaults	in	26 cases
9.	Other possibilities	in	25 cases
10.	Laboratory infections	in	11 cases
11.	Teachers to pupils	in	10 cases
12.	Impartial cases	in	614 cases

It is evident that this table emphasizes the importance of the rôle of contact in the spread of typhoid fever.

Difficulties in the work were numerous. It is pointed out that the discovery of the relation of a new case *merely* to a previous case is unsatisfactory. Such a finding does not demonstrate the ultimate source. Again, the work involved in making a complete investigation of all possible contacts is tremendous, prohibitive. House-to-house investigation of all individuals in a community only is indicated in the

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face of the regular reappearance of unconnected cases in the population. Sporadic cases do not warrant carrying the search outside the more obvious contacts. To discover possible new mild cases, and therefore temporary carriers, the taking of the temperature of the immediate contacts of typhoid cases has given good results.

More recent history of typhoid in the area.—In the area served by the laboratory at Trier it has been possible to secure figures for the years 1912–1918. In this limited area the figures for actual cases are as follows:

1912	1913	1914	1915	1916	1917	1918
391	338	277	320	343	533	502

There was, therefore, a decrease from 1912 to 1914. In 1915 there was a considerable increase, with a remarkable jump in the number of cases in 1917 and a slight decrease in 1918. It is interesting to note that the dysentery cases for the same period were:

1912	1913	1914	1915	1916	1917	1918
4	0	18	149	231	760	222

This dysentery is reported chiefly of Shiga type of bacillary dysentery. The relation of the bacillary dysentery case-incidence to the typhoid case-incidence is noteworthy.

The war affected considerably the anti-typhoid work in the are. The following factor may be mentioned:

1. Troop movements.
2. Influx of foreign population, prisoners, munition workers.
3. Return of soldiers on leave, sick, or wounded from France, Russia, the Balkans, etc.
4. Withdrawal of personnel from institutes.
5. Laboratories' supplies, in some particulars, lacking, *e. g.*, agar was 124 marks a pound and not to be secured in adequate amounts.

SUMMARY OF REPLIES TO "TYPHOID" QUESTIONNAIRE

On January 27, 1919, a questionnaire was submitted to the Geheimrat physician of the administrative district and all the kreisärzte and laboratories for the control of typhoid fever within the area occupied by the American Army.

The questionnaire in translation is attached.

This summary is based on replies received from the kreise of Berncastel, Saarburg, Trierland, Daun, Mayen, Cochem, Neuwied, Altkirchen, Adenau, Coblenz, Prüm, Ahrweiler, Wittlich, St. Wendel and the Stadtkreis of Trier.

Typhoid cases and deaths have occurred as follows (the mortality by years is also shown):

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	1912	1913	1914	1915	1916	1917	1918	*Total*
Cases.....	391	338	277	320	343	533	502	2,704
Deaths.....	37	23	28	26	23	52	39	228
Mortality (per cent)	9.7	7.0	10.1	8.1	6.7	9.8	7.8	8.4

Paratyphoid cases have been entirely of the paratyphoid-B type. Cases of paratyphoid have occurred as follows:

1912	1913	1914	1915	1916	1917	1918	*Total*
44	56	21	49	48	41	20	279

There has occurred, therefore, approximately one case of paratyphoid-B for every ten cases of typhoid.

Bacteriological diagnosis.—The replies are in many cases not clear on this point. The Widal test was done practically always. Cultural diagnosis was rare, considerably less than in one-half the cases.

Carriers.—Carriers under observation for the various yearly periods show:

1912	1913	1914	1915	1916	1917	1918
80	96	97	107	116	112	115

Chief source of origin of new cases.—The replies vary somewhat. It must be remembered that the personnel of doctors in these areas has changed considerably due to the war. The following opinions are given:

5 report contact only as chief cause.
4 report contact and imported cases as chief cause.
3 report water and contact as chief cause.
2 report water and contact and imported cases as chief cause.
1 report water, milk and contact as chief cause.
1 report water only as chief cause.

Carriers, how discovered? To this question, the replies may be grouped as follows: 4 replied, from examination of convalescents and contacts; 6 replied, from examination of contacts; 2 replied, from examination of stools and urine; 4 replied, not done.

Was the house-to-house search for cases and carriers effective? Six replies were unsatisfactory, 5 replied that it was not done, 3 replied "Yes," 1 replied that it was done only on the occurrence of a case, 1 replied that it was effective when done.

(The question was perhaps misunderstood and perhaps the question was based on misinformation. The fact is that the house-to-house search, meaning the investigation of every person in a community, was never done except in one or two instances involving a very restricted area. An investigation of all the inmates of a house where a case occurred and even of neighboring closely associated dwellings was the rule.)

Was the house-to-house search done in the last six years? One replied

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"yes, following each new case." The rest of the replies were negative or unsatisfactory. See preceding paragraph.

Was the educational propaganda effective? Five replied "Yes," one of these adding that "secondary cases *do not* occur;" 1 replied "Doubtful, secondary cases *do* occur"; 1 replied "Probably;" 1 replied "No, carriers don't follow directions"; 5 replied unsatisfactorily, explaining that they had not had sufficient experience (The personnel has changed on account of war); 3 replied that no educational propaganda was carried out.

What is the per cent of undiscovered carriers per total population? This difficult question was unanswered fifteen times. Only one hazarded a guess, one-eighth of 1 per cent.

Paratyphoid carriers: 2 reported one each; 14 reported none.

Bacilli associated with food poisoning: 15 reported "none;" 1 reported 6 cases of botulism.

Dysentery during last seven years was reported as follows:

	1912	1913	1914	1915	1916	1917	1918
Cases	4	0	14	138	224	681	594
Deaths	0	0	1	24	21	113	63
Mortality rate (per cent)	....	....	7.1	17.4	9.4	16.6	10.6

The above figures, as near as can be determined, are for the civilian population. The figures for the military population are very incomplete and unsatisfactory. They follow:

	1912	1913	1914	1915	1916	1917	1918
Cases	0	0	4	11	7	79	163
Deaths	0	0	1	0	0	?	21
Mortality rate (per cent)	....	....	25	0	0	?	13.5

Dysentery bacteriological diagnosis.—The cultural diagnosis was very rarely done, judging from the reports. The Widal test was used, but how much it is impossible to say.

Epidemics of dysentery.—Eight small epidemics are mentioned, one in an asylum, three of the others are reported as due to cases imported with returning soldiers.

Chief method of spread of dysentery is reported as follows: 12 give contact as chief cause, 2 give no reply, 2 give flies as chief cause.

Stool examinations for dysentery.—According to the replies this was rarely done.

Trier laboratory report.—Inasmuch as this laboratory covers considerable of the same ground dealt with in preceding portion of this paper, it was considered necessary to summarize it separately. The following table shows actual number of cases of typhoid and dysentery, with the mortality in each instance, and separately for the military and civil population.

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	1912	1913	1914	1915	1916	1917	1918
Typhoid total	137	101	247	128	132	206	178
Deaths total	16	15	37	15	15	21	16
Civilian cases	137	99	112	95	126	196	173
Civilian deaths	16	15	16	11	13	20	15
Military cases	0	2	135	33	6	10	5
Military deaths	0	0	21	4	2	1	1
Bacteriologically proven	131	94	238	121	121	171	158
Widal reaction done	131	97	238	125	125	202	171
Widal not done	6	4	9	3	7	4	7
Carriers under observation	58	69	76	78	78	78	80

	1912	1913	1914	1915	1916	1917	1918
Dysentery total	10	0	46	20	32	240	
Dysentery deaths	0	0	2	2	0	3(?)	
Civilian deaths	0	0	2	2	0	3(?)	
Military deaths	0	0	0	0	0	0(?)	
Bacteriologically proven	10	0	43	18	31	240	
By Widal test	0	0	26	14	19	239	
Shiga	0	0	14	2	14	154	
Y	0	0	12	11	5	85	
Flexner	0	0	0	1	0	0	
By stool culture	10	0	19	4	12	10	
Shiga	0	0	0	1	0	6	
Y	0	0	16	3	0	4	
Flexner	0	0	3	0	2	0	

In 1918, because of lack of laboratory material, the Trier laboratory had to give up the diagnostic work on dysentery. The Trier laboratory gives the following figures on the source of infection of typhoid fever (72 per cent of cases were "determined"):

	Per cent
Contact with typhoid cases	60
Contact with carriers	5
Imported cases	5
Water	1
Milk	1

In the first two years of the war, the imported cases amounted to about 50 per cent of the total.

Carriers were discovered by investigation of the area and associates of typhoid cases. *Control of carriers* is considered the most effective and most important principle in the fight against typhoid fever. *Educational propaganda* has been *most effective*. *Paratyphoid fever* has been entirely of the B type, 310 cases in the last seven years.

Paratyphoid carriers.—Seven paratyphoid-B carriers were discovered.

Of other intestinal bacteria, especially those associated with food poisoning, only one case occurred in seven years, this due to *Benteritidis*.

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Dysentery and stool culture.—Bacilli of dysentery were discovered in only 10 to 15 per cent of all dysentery cases. This is due to the slight viability of the organisms, especially to long transport to laboratory.

QUESTIONNAIRE

(Answers to be made by paragraphs numbered to correspond with questions.)

TYPHOID FEVER

1. How many cases of the disease occurred in the territory under your jurisdiction in 1912 ....., 1913 ....., 1914 ....., 1915 ....., 1916 ....., 1917 ....., 1918 .....? (Do not include figures for paratyphoid among these figures.) Separate soldiers from civilians and give places where these cases occurred.

2. Were all cases bacteriologically proven?..... Widals?.....

(*a*) Were Widal reactions made in every case?.....

(*b*) In how many cases?.....

(*c*) In how many cases not used?.....

3. How many deaths?..... Civilians?..... Soldier?.....

4. Name what you believe to have been the chief causes of infection in order of their importance and give your reasons.....

.....

.....

5. How many bacillus carriers were under surveillance by you in 1912?..... 1913....., 1914....., 1915....., 1916....., 1917....., 1918.....?

6. How were these carriers detected?.....

.....

7. Do you believe the house-to-house search for carriers, as originally conducted, succeeded in disclosing most of the carriers?.....

(*a*) Has this been done at any time within the last six years by your laboratory? ..... If so, give reasons, places and dates.....

.....

8. Do you believe that the educational propaganda against typhoid among carriers, has aided materially in reducing the number infected by them? Reasons?

.....

9. What percentage of the population do you believe to be undetected carriers? ..... Upon what do you base these figures?.....

.....

PARATYPHOID FEVER

1. How many cases of the disease were due to the bacillus of the Alpha type during the years 1912 to 1918?..... Of the Beta type?.....

2. Were any carriers found?..... If so, were they of the Alpha or Beta types?.....

3. In these years were there discovered any infections with B. enteritidis, suipestifes, or any of the other intestinal group of bacilli usually associated with cases of food poisoning?.....

DYSENTERY

1. Give number of cases and places occurring in the years 1912....., 1913....., 1914....., 1915....., 1916....., 1917....., 1918..... Separating soldiers from civilians, also give the number of deaths, civilian and military.....

.....

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2. Were all of these cases bacteriologically proven?..... Tell how, and what types of organisms were found.....
.....

3. Give brief history (not over 300 words) of the largest epidemic, causes, proof, anything worthy of note.

(18 lines.)

4. What have been the chief methods of spread of the disease?.....
.....

5. What percentage of all the patients whose stools have been examined for the dysentery bacillus on account of having diarrhea have been found to contain the organism?..... Do you believe the figures to be too high or too low?..... Wherein does the error lie?.....

Report on The Royal[1] Institute for Hygiene and Infectious Diseases, Saarbrücken

The laboratory was established in 1902 as one of eleven similar laboratories founded at the same time to assist in the intensive campaign against typhoid fever in southwestern Germany. (See "Report on the Intensive Anti-typhoid Campaign in Southwestern Germany, March 18, 1919.)

Bacteriology.—Work on paratyphoid fevers was, of course, included from the start, and bacillary dysentery was soon added for investigation.

From such a beginning, the institute developed into a public health laboratory making examinations, also, of material for tuberculosis, glanders, syphilis, gonorrhea, chancroid, pneumonia, influenza, diphtheria, cerebro-spinal meningitis, cholera, typhus, plague, etc.

However, the diagnosis and treatment of rabies is not done, nor are therapeutic sera and smallpox vaccine virus prepared. Autogenous vaccines are made.

Private examinations, that is, special work for physicians for which a fee is charged by individual workers at the laboratory, is permitted.

Chemical examinations are also done to assist in the diagnosis of disease as may be requested. But the chief chemical work is the examination of public and private water supplies, the study of sewage and sewage disposal problems, the examination of smoke and air in their relation to public health in factories, mines, and public places. The nutritive value of foods has engaged especial attention during the past few years.

Educational.—Courses are given to physicians and especially to the Kreisärzte, or local health officers, on public health problems. The institute has a lecture hall seating, perhaps, 200 people. This hall is well-equipped with platform, desk-chairs, projection apparatus and curtain. The room may be darkened for lantern-slide lectures.

[1] "Royal" has been changed to "Prussian."

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There is a room for the practical demonstration of methods of disinfection. This room is fitted up as a bedroom of the usual type. There is a disinfecting apparatus, fitted on a hand cart, one of which is placed with each Kreisärzt. Thus the public health officer of the smaller districts is given a very practical training in this important feature of his work.

Maintenance.—Each Kreis (smallest administrative district) may have free service of the laboratory by paying an annual tax of 6 marks per one thousand inhabitants. This optional tax is paid by practically all "Kreise." In addition, 3 marks is paid by patient for an examination for syphilis or gonorrhea, unless the patient is financially unable. Any balance required for maintenance is furnished by the Prussian State.

Location and building.—Since 1912 the institute has occupied a building on the Unssberg, a considerable height overlooking Saarbrücken. A hospital is close by, but, in general, the laboratory is not centrally located in the city. The director confessed that the location was a mistake from the important standpoint of keeping in touch with the physicians.

The building is excellent, incorporating all ideas as to modern laboratory construction. There is a director's office and private laboratory on the ground floor, also a receiving office for specimens conveniently located, a large record office, a media-preparation room, a wash-room (kitchen) a special small room for autoclaves, a special small room for incubators, a room for ice-boxes, a toilet, and a large bacteriological laboratory. On the second floor is the assistant director's office (in charge of the chemical division), a private laboratory and a large chemical laboratory, the large lecture room mentioned above, and a good library. On the third floor is a small laboratory, equipped at this time as a bubonic plague laboratory where very complete preparations had been made for a possible outbreak of plague in Germany, portable equipments, etc. On the third floor, also, a photographic room containing a photomicrographic apparatus of excellent pattern; a drawing-room for drafting, illustrating, etc.; and several baths. The basement contained among other things the disinfection-demonstration room and quarters for the help.

Personnel.—There is a director in active charge of the bacteriological division. In this bacteriological work he has four assistants, all doctors of medicine. There is an assistant director, in immediate charge of the chemical division with two assistants, doctors of philosophy. In addition there are four women assistants (*Laborantinnen*) and several workers (*Dieners*).

Administration.—The director is responsible to the Prussian Ministry

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(formerly *Minister*) of the Interior. He has nothing to do directly with the German government (imperial government) nor with the city government. His position is an advisory one, in particular to the president of the *Regierungsbezirk* (Administrative District). He has no police powers directly.

The director of the institute at Saarbrücken is the scientific adviser to the institutes at Trier and Idar in the same district.

Records.—Forms are supplied to be filled out to accompany specimens sent in by doctors. Reports are sent out on special forms for diphtheria, tuberculosis and the Wassermann reaction. For typhoid fever there is a particular blank and, in the event of a new case, an elaborate questionnaire. Bacillus carriers are made a matter of special record. For the rest there is what might be called a miscellaneous form.

If a positive finding of a contagious disease is made, the Kreisarzt is always informed, in addition to the doctor sending the specimen.

In filing records, in addition to usual methods, separate files are kept for the various Kreise.

An annual report is made to the Ministry of the Interior. During 1918 over 50,000 examinations were made.

Laboratory Methods: (*a*) *Tuberculosis.*—Sputa are stained routinely by Ziehl's method. Pappenheim's stain is sometimes used, also Much's. Negatives by Ziehl are antiforminized and the stain repeated. Complement-fixation test for tuberculosis is not considered valuable. Von Pirquet tests are not required of the laboratory. The director does private opsonic index work in tuberculosis.

(*b*) *Glanders* rarely is a subject of investigation. In addition to cultural diagnosis, the complement-fixation test is considered excellent.

(*c*) *Syphilis.*—For the primary or superficial lesion, the dark-field examination is the procedure of choice. Other procedures are the india-ink method, Gelinsa's stain or silver impregnation (Levaditi-Fontana). The complement-fixation test is the original method, using the extract of fetal syphilitic liver as an antigen. Two such antigens are used. The Lange test is done, but the director is skeptical as to its value. Provocative Wassermanns are occasionally called for.

(*d*) *Gonorrhea.*—The routine diagnosis is the Gram stain. Complement-fixation test is not employed. Vaccines are prepared.

(*e*) *Chancroid.*—Ducrey's bacillus is looked for in stained preparations.

(*f*) *Pneumonia.*—No typing is done. Vaccine prophylaxis is not used. To the director's knowledge, therapeutic sera are not employed.

(*g*) *Influenza.*—The director believes that the Pfeiffer bacillus is the cause. For culture, blood agar and "cooked" blood agar (Löwen-

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thal's) is used. During the epidemic he recovered the Pfeiffer bacillus regularly. Vaccines have not been used.

(*h*) *Meningococcus.*—Type determination is not a routine procedure. The director thinks there are three types recognized in Germany. Ascites agar is the culture medium of choice. Only polyvalent therapeutic sera are used. There has been comparatively little meningitis in the last few years.

(*i*) *Typhoid.*—Blood culture methods are not given their proper value in the diagnosis of this disease, probably because of the difficulty of getting proper specimens through the mail. The Widal test is considered the most important instrument in the diagnosis of typhoid. The agglutination test is macroscopic, and the director has lately published an article claiming 100 per cent positive Widal reactions in typhoid bacillus carriers. For this test he uses strains of the bacillus in a mixture, and an incubation at 37° C. for as much as twenty-four hours, reading his results with a hand lens.

Stool and urine culture are excellently done, judging by results. Enrichment on malachite green agar plates is followed by plating on Endo or Conradi-Drygalski plates.

For water, if done, the ferric chloride precipitation is employed.

The vaccine is considered excellent as a prophylactic measure. It is not extensively employed in the civil population. The vaccine is a saline suspension. Lipo-vaccines are not used.

(*k*) *Paratyphoid fevers* are diagnosed by the same methods as typhoid. Beta type is the usual paratyphoid, the Alpha type being rare. There is no vaccine used for prophylaxis, the explanation being that the disease is so mild.

(*l*) *Dysentery.*—Culture on stool specimens arriving by mail yields poor results due to the time elapsing during shipment. The Conradi-Drygalski medium is considered best for this purpose. Widal test yields the most important diagnostic results, a mixture of several strains of one type being used. A vaccine has been used extensively in the military population. It is called "Dysbacta" and is a mixture of the various types of dysentery bacilli treated with the various immune sera, *i. e.*, it is a sensitized dysentery bacillus vaccine.

(*m*) *Cholera.*—The laboratory has had no occasion to work on cholera.

(*n*) *Typhus.*—There have been a few cases. The etiology is unknown. B. proteus agglutination test is considered absolutely specific.

(*o*) *Diphtheria.*—Material is sent in on swabs merely, *i. e.*, no culture media is used until the specimen reaches the laboratory. Direct smears and stains are then made and culture is done on plates. Alkaline methy-

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lene blue is the preferred stain; the method of Neisser is also used.

(*p*) Diphtheria carriers, if children, are kept out of school. Other carriers cannot be controlled.

(Inquiries about pellagra brought the reply that there have been no casses beyond exceptional instances such as occurred before the war.)

Special work.—The director is interested in pathogenic moulds, microsporon and tricophyton. The chemistry division has worked on the nutritive value of a variety of cowpeas.

Histopathology.—Very little of this is done. A few gross pathology specimens were on exhibition.

Entomology.—The laboratory has dabbled a little in this subject. A few well-mounted specimens were shown.

Clinical chemical pathology.—Very little of this work is required of the laboratory. The little done is in the nature of private work. The examination of drugs is not made except to test their scientific value. The adulteration or misbranding of foods is not investigated, another laboratory having this as its function, the police medico-legal laboratory.

Located as it is in a great coal-mining district, the sanitary conditions of the mines receive special attention—smoke, dusty air and ventilation.

Discussion.—The institute is well housed and equipped. Its personnel is adequate in numbers, and capable. Its immediate location makes it rather inaccessible. As to methods, as might be expected in a public health laboratory, standard methods only are used. The institute differs very little in essentials from similar institutions of like size in America. The malachite-green enrichment method for the examination of stools for B. typhosus has a firm place in the laboratories here and, although employed in America also, deserves, perhaps, more extended use. (Brilliant green may be used for malachite green.) Another particular may be mentioned here again—the use of the diphtheria swab without culture media. But, in this instance, one is inclined to favor the usual American method. In general, it may be said that the laboratory meets the public health requirements for the particular situation.

[*Translation*]

Typhoid Memorandum

COMPOSED IN THE IMPERIAL HEALTH BUREAU

1. *Nature of the disease.*—Typhoid, also called abdominal typhoid, nerve fever, or pituitous fever, is a contagious disease, which is produced by the typhoid bacillus. Also many slight illnesses designated as gastric fever are true cases of typhoid.

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2. *Course of the disease.*—The typhoid disease generally breaks out two or three weeks after the reception of the contagious material. As a rule it begins gradually with a headache, chills and fever, and temperature, as a result of which most patients must soon take to bed. At the same time excretions of bright yellow color occur, the fever mounts from day to day and reaches toward the end of the week of sickness 40° (Centigrade) or higher. The patient is tortured by great thirst, his tongue is coated, and, like his lips, dry; his sleep is troubled. In the second week, during which the fever usually remains equally high, there generally follows a considerable diminution in strength, and nervous symptoms such as stupor or delirious unrest appear. At this time there appear upon the breast, the stomach, often also on the upper thighs, scattered bright red spots resembling flea-bites, which disappear under pressure of the finger and reappear as soon as the pressure is removed. Seldom is lung catarrh absent; at times pneumonia occurs.

During the third week the fever begins to subside slowly and gradually and, when the course of the disease is favorable, the disease may be considered as over after the fourth week. Nevertheless, the convalescents need another month of rest for their complete recovery. In cases where the course of the disease is unfavorable, the fever remains continually high; the loss of strength and the unrest of the patient increase, and death follows in the course of four or five weeks. Especially bad complications may lead to death earlier. The mortality, which can be considerably decreased by proper treatment and care, varies between five and fifteen of every hundred patients.

3. *Treatment of the disease.*—There should be no delay in getting a physician at the earliest possible moment. Since the disease begins with an ulceration in the intestines, the patient must receive, during his sickness and convalescence, only such food as is prescribed by the physician. Mistakes in nourishment can increase the tendency to intestinal hemorrhages already present, and even lead to death through laceration of the intestines at the point of ulceration. The danger exists especially during recovery, when the patient begins to feel great hunger. A good bed for the patient is necessary in order to prevent bed-sores. As long as there is fever one should care for feeding and quenching of thirst according to minute prescriptions from the physician. Very often even severe cases owe their recovery to careful nursing. Such care is especially possible in hospitals; it is, therefore, in the interest of the patient himself that he be brought there as soon as possible.

4. *Transmission of the disease.*—The germ of infection is given off by the typhoid patient chiefly in his intestinal excretions and urine, at times, also, in his saliva, nose mucus and sputum (in coughing, sneezing

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and vomiting). It is urgently advised that, in case of a typhoid suspect, specimens of his stool, urine, and if possible, his blood, should be sent to a bacteriological laboratory to determine the presence of the disease, and under certain conditions this should be done repeatedly. At times the excretions of the patient contain the material of infection a long time after recovery. Oftentimes people give off the material of infection, who have acquired the cause of the disease through contact with a typhoid patient or with infected objects, but who have not fallen ill themselves.

For transmission of the disease, mere traces of the exeretions suffice. If these reach underwear and bed-clothes, clothing, the floor, eating and drinking utensils, and in particular food, such as milk, vegetables, fruit, salad, they can easily be taken up by other people. Moreover, the material for infection can be spread, by water which, during the washing of eating and drinking utensils, has been tainted with the typhoid germ. Flies may also act as carriers. Transmission through dirty objects of use is all the more possible, because the patient passes his excretions not rarely while in an unconscious condition.

If the typhoid germ is transmitted in the immediate vicinity of the patient, the result is generally individual cases of the disease.

If, however, the germ reaches an article of food used commonly, such as drinking water or milk, masses may acquire the disease; indeed the consequence may be explosion-like outbreaks, with hundreds or thousands of cases.

5. *Isolation of the diseased.*—The treatment of a typhoid patient at home is only possible with the greatest difficulty, because of the great danger of infection. It is for this reason advisable to send the patient to a hospital as soon as possible. This is especially to be recommended where the dwelling is too small or where transmission to wider circles is to be feared, as in hotels, inns, bakeries, educational, welfare, criminal and similar institutions, schools, milk, vegetable and other food businesses.

If, however, in exceptional cases the transfer of a patient to a hospital is not possible, then he must be placed in a room isolated as far as possible from the rest of the house; all unnecessary intercourse with the patient is to be avoided. No one should visit a typhoid patient unless it is his duty. Children in particular should not be allowed near a typhoid patient, since, as experience shows, they become easily infected and carry the disease further by contact with other children. Children from houses or families where there are typhoid cases should therefore be kept from school and from intercourse with other children, especially in streets and public places.

Whoever has touched a typhoid patient, his clothes or bed, should wash his hands carefully with a liquid disinfectant (see No. 6).

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For the prevention of transmission it is necessary that the sick room is furnished as simply as possible, and is gone over daily with a damp cloth. Carpets and curtains should preferably be removed.

In rooms where typhoid patients are found, one should never partake of food and should refrain from smoking, not only out of consideration for the patient but in one's own interest. Food and drink left over by the patient should be poured into the water-closet.

6. *Conduct of the nursing personnel.*—Those persons who care for or nurse typhoid patients should wear clothes which can be easily cleaned, or aprons which cover the entire front of the body and at all times maintain the greatest cleanliness. If they have touched the patient or his clothes, or have removed his excretions, they must brush their hands thoroughly with a sublimate solution or diluted cresol water and wash them about five minutes after with warm water and soap. For this purpose a basin of disinfecting fluid should stand ready in the sick room. They should be especially careful when bathing the patient; sprinkling about of the bathing water should be guarded against. They are most urgently warned against touching food with undisinfected and uncleaned hands, or putting objects to their mouths, which may have been tainted in the sick room, for example, eating and drinking dishes.

7. *Treatment of excretions.*—In the case of typhoid, disinfection at the sick bed is of especial importance. From the beginning of the disease to the end all excretions of the patient, as well as the objects used by him, must be continually disinfected. Typhoid patients should not use water-closets. Their excretions (stool, urine, vomiting) should be gathered in vessels easily cleaned, and may not be emptied in undisinfected condition in water-closets or on dung-heaps. They must first be made harmless by an equal amount of lime milk or diluted cresol water. Only after the mixture has stood for two hours may it be emptied into water-closet. Every spilling, as well as every befouling of floor, clothes, etc., even if it be with the smallest remnants of excretions, must be avoided carefully. The intestinal excretions and urine of typhoid patients must never be poured out in the neighborhood of wells or watercourses from which drinking water or water for use is taken; the emptied vessels may not be cleaned at these watering places.

The sputum also of the patient must be carefully gathered up and made harmless; the clothes should be placed for at least two hours in diluted cresol water before they are given out to be washed. For gathering up the sputum, wiping the mouth, nose and the like, muslin cloths can be used to the greatest advantage, which after use should be disinfected or burned. The washing and bathing water of typhoid patients may likewise cause infection. It must therefore be removed so that it cannot damage, and must not be emptied in the neighborhood

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of, wells or watercourses. Before removal it is made harmless by mixture of chloride of lime milk. Enough of the latter is to be added to give the mixture a strong chlorine odor. The liquid may only be removed after two hours from the time of mixture with chloride of lime. With reference to water valves and sewerage pipes, the use of chloride of lime milk, clarified by being allowed to settle or by straining, is recommended.

Persons who, without being sick, give off typhoid bacilli (bacillus carriers) should ever bear in mind the especial danger which they are for their environment. They must, as in the case of the diseased, disinfect their excretions until the official physician declares on the basis of a bacteriological investigation that infection is no longer to be feared. As material for such investigations, specimens of stools for bacteriological investigations are sent from time to time to the proper places. Besides, bacillus carriers should disinfect their hands after every stool, or at least, wash them carefully with soap and water, because there is danger that otherwise the infectious material may be carried to food or other objects. The bed-clothes and underwear of the bacillus carrier should also be disinfected.

8. *Treatment of linen clothing and utensils.*—Bed-linen and underwear, clothes used for cleaning the patient and washable clothes should be placed in vessels with diluted cresol water. They must be completely covered with this liquid and may be cleaned only after two hours. Pieces of clothing which are not washable are, if possible, to be disinfected by steam in a disinfecting establishment; if this is impracticable they should be brushed with diluted cresol water. The patient should have his own eating and drinking dishes, which are to remain in the sickroom and be cleaned there. Before they are used by others they must be boiled for fifteen minutes in water, to which soda may be added.

9. *Disinfection of the house.*—Dirty parts of the floor or the sick room are to be covered at once with diluted cresol water or a sublimate solution and mopped up after one hour.

After the patient has been transferred to the hospital or to some other suitable place, as well as after his complete recovery or death, the sick rooms and all other rooms used by the patient, together with their contents, are to be thoroughly disinfected according to the physician's directions, preferably by means of proven disinfectants. Special care in disinfecting is to be shown in hotels, inns, educational, welfare, criminal and similar institutions, as well as on ships.

10. *Handling of food.*—The preparation, preservation and sale of food near where there are typhoid patients may under no circumstances

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be permitted. Bacillus carriers may not be engaged in obtaining, preparing or selling food.

During an epidemic, the use of water, milk, fruit, or vegetables in an uncooked state is by all means to be discouraged.

11. *Transportation of typhoid patients.*—Typhoid patients are to be transported, if possible, in ambulances. Public conveyances (carriages, street cars and the like) should not be used. If this occurs in exceptional cases, thorough disinfection must follow immediately.

Infection may also come from typhoid corpses. They should be taken as soon as possible from the house where the death occurred to a corpse-room, or, if there is none, to an isolated room that can be locked. Setting out the corpse in an open coffin, handling in the house where the death occurred, etc., are dangerous and, therefore, forbidden.

Remarks.—As disinfectants, are recommended:

1. Diluted cresol water (2.5 per cent). For producing it are used either 50 c. c. (*i.e.*, 3 or 4 tablespoons) of creosol soap solution (liquor Cresoli Saponatus of the Medicine Book for the German Empire) or ½ liter of creosol water (aqua cresolica) mixed with ½ liter of water, making a liter of disinfecting fluid.

2. Sublimate solution (1/10 per cent). For producing it either one tablet of one gram or two tablets of ½ gram each of the purchasable pink sublimate tablets (Pastilli Hydrargyri bichloride) are dissolved in 1 liter of water.

3. Lime milk. Freshly burnt lime is placed undiminished in size into a roomy vessel and is sprinkled evenly with water (about half the quantity of the lime); it thereupon dissolves amidst considerable heat and expansion into lime powder.

The lime milk is prepared by gradually adding 3 liters of water to each liter of lime powder, stirring the mixture all the time.

If freshly burnt lime is not at hand, the lime milk can be produced by mixing 3 liters of water with each liter of slack lime as it is found in a lime pit. In these cases, however, care must be taken that the upper layer of lime affected by the influence of the air is removed.

The lime milk is to be stirred or turned over before using.

4. Chloride of lime milk is made of chloride of lime (calaria chlorate) which has been preserved in airtight barrels, protected from light, and which should possess a sharp chlorine odor. To each liter of chloride of lime 5 liters of water are gradually added, while the mixture is continually stirred. Chloride of lime milk is to be prepared each time before using.

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WAR DERMATOLOGY IN FRANCE AND THE PREVENTIVE MEASURES TAKEN

By Lieutenant Colonel FRANK CROZER KNOWLES, M.R.C., U.S.A.
Consultant in Dermatology, American Expeditionary Force

(*Concluded*)

DISINFESTATION

WHILE there are a considerable number of different methods by which lice, nits and the parasites of scabies can be destroyed, the general consensus of opinion is that for large scale disinfestation, such as is necessary in an army, heat is to be preferred to fumigation, immersion, or other chemical methods. Heat may be applied as steam or as dry heat, and it seems likely that it will be necessary to make use of both of these forms of heat, adapting the method to the conditions and the locality.

Moist Heat.—The Foden-Thresh and similar mobile steam disinfectors can be used to great advantage in the sterilization of clothing, blankets, etc., at baths and laundries where hot air chambers are either in the course of construction or permanently unavailable. They will form an important mobile emergency apparatus for isolated units and temporary camps. Several machines of this type or of the trailer variety are now being made by the Geneste-Herscher Co. (French), the Grampian Engineering Co. (English), and the American Sterilizing Co.

Two very compact outfits are manufactured by the Geneste-Herscher Co. The camion carries sufficient tentage and equipment for a complete bathing establishment, and the trailer in one instance carried heater and boiler for baths, while in the other a disinfestation outfit was also present. Most of these machines have a capacity of handling from seventy-five to one hundred blankets at a time or an equivalent number of suits of underclothing.

The wooden steam chambers with perforated and unperforated pipes are probably the best form for the treatment of underclothing at laundries and blankets at large permanent stations in the area of the rear, since they can be constructed for any required capacity, are simple in operation, and kill bacteria as well as vermin.

Dry Heat.—Dry heat is being employed chiefly by means of the so-called Jacobs hot-air chamber.

CHEMICAL DISINFECTANTS

Numerous chemical substances have been suggested for the killing of lice. Bacot has carried out extensive experimentation along this line, and we will depend largely upon his findings for our deductions. Cys-

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tisine, at the suggestion of Dr. H. H. Dale, was tried; this preparation is an alkaloid showing similar physiological properties to those of nicotine, but much less volatile. It is extracted from the seeds of gorse and laburnum. This preparation, although quite satisfactory from an experimental point of view, has two apparently unsurmountable difficulties which prevent its use as a practical remedy. First, its possible toxic effect if used to impregnate garments, and, second, the high cost of production. The other preparations which this experimenter tried were flowers of sulphur dissolved in carbon bisulphide, the solution containing 15 per cent of sulphur and having no great lethal action on lice. Vermijelli had practically no effect on the louse. Cresylic acid was only partially effective. The net result of the various trials show that the diffuse effects of all substances, except possibly naphthalin is so slight as to reduce them all to a common level of contact remedies. Naphthalin, used as a powder, is likely to be wasted. If used in a form in which garments can be impregnated with it, it is an almost perfect remedy, as it kills quickly, and when there is any risk of infection is probably the best means available. The chief objection is its rapid evaporation; by the second day after impregnation of shirting its power has either waned or has already departed.

Bacot found, however, an extremely effective remedy in the killing of lice was an emulsion consisting of equal parts of soft soap and crude liquid carbolic acid (the suppliers state that the fluid consists chiefly of cresols with a little phenol and a certain proportion of higher homologues). This emulsion, as finally devised by Bacot, consists of 45 to 50 per cent of soft soap, combined by heating with 50 to 55 per cent of crude carbolic; a 5 per cent solution of this emulsion in warm water is the proper strength. The underclothes and flannel shirt are placed in a tub of this preparation and then wrung out. A normal sized flannel shirt will retain, after wringing, between 500 and 600 c.c. of the mixture. The preparation costs approximately one penny per garment. This preparation, according to the experiments, is effective in the eradication of lice for seven to eight days after its application. Maj. Kenneth Taylor and his assistants (No. 2 Red Cross Hospital) wore garments impregnated with this emulsion for several weeks without irritation to the skin.

Gunn advises that the bodies of the soldiers should be bathed with gasoline containing 1 per cent sulphur and 1 per cent naphthalin, and their clothes dipped in the same solution. This solution, and also the N. C. I. powder, are undoubtedly effective, but should be employed every second or third day. This N. C. I. (naphthalin 96 per cent, creosote 2 per cent, iodoform 2 per cent) powder depends for its letha

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properties on the naphthalin, the iodoform making it more adherent and hence more efficacious. Commercial naphthalin is much more efficient than the chemically pure product. The attached chart will show clearly what an effect this powder has in reducing lousiness.

Date	Place	Organization	Strength	No. men exam.	Pedic	Scabies	Remarks
1918							
6–29	Entree des-Eaus.	Co. H., 60th Inf.	230	166	29	18	Just out of trenches after 12 days.
6–29	Entree des-Eaus.	Co. F, 60th Inf.		122	26	9	Do.
6–29	Maudray	Co. G., 60th Inf.		161	32	9	
6–30	Maudray	Hdqrs. Co.....		22	4	1	
6–30	LeTholy..	Co. E, 7th Engrs.	216	208	15	8	
6–30	LeTholy..	Med. Detachment	13	13	3	0	
7–3	LaCollet..	Co. A, 15 M.G. Bn.		160	20%	0	
7–6	Ardies....	Co. A, 61st Inf.	176	170	2%	0	Been using N.C.I. pulv.
7–6	Ardies	Co. B, 61st Inf...	198	190	5%	1%	In line 19 days. No bath.
7–6	Ardies....	Co. C, 61st Inf...	197	188	30%	1%	Do.
7–6	Ardies....	Co. D, 61st Inf...	193	185	2%	0	N.C.I. pulv.
7–6	Ardies....	Co. L, 61st Inf...	176	160	30%	1%	Just out of line 19 days.
7–12	Vignal....	Cos. A, C, D.....		80	6%	0	In line.
7–12	Paris.....	.....		70	2%	0	In line.
	Corcieux	Fd. Hospital.....	80	79	0	0	15 Tinea Cruris.

The French Army, at the advice of the Pasteur Institute, has adopted an anti-louse device, consisting of pieces of cloth worn as a scapular on the chest and back; the cloth is moistened with a lotion consisting of three parts each of essence of Indian Verbena, essence of pennyroyal, essence of eucalyptus and one part of naphthalin. They are moistened every four days and are said to keep the men practically free from lice.

Bacot and Lloyd have recently carried out some interesting experiments. "Destruction of nits of the clothes louse by solutions of creosol soap emulsion and lysol." The evidence as a whole seems to establish the fact that steeping for twenty minutes in a 2 per cent solution, either lysol or the cresol soap, is quite effective provided the temperature is not below 50° F.

It will prove instructive to give in some detail the manner of delousing and bathing as employed in the French and American Armies.

PORTABLE DELOUSING AND BATHING STATIONS IN USE BY FRENCH ARMY

These stations are distributed along the entire French front, two to a corps. They are admirably fitted for disinfestation and bathing.

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They are located usually in the rest area, but far enough forward so as to be accessible to the troops in reserve areas as well.

Men are sent to the baths in groups of fifty every forty-five minutes. Upon arrival they are taken in groups of twenty-five every twenty or twenty-five minutes.

These men are taken into room No. 1 where they are stripped; khaki and overcoats are passed into disinfecting chamber (No. 4), where they are exposed to free steam for ten minutes and dry heat at 115° C. for twenty minutes. During this process men are passed into room No. 2, where they are thoroughly bathed for twenty minutes. They then pass to room 3, where a change of underclothing is supplied, and they receive the deloused garments from the chamber into room No. 3.

This station is used principally as a bath, as they do not delouse clothing as a routine, only taking, for delousing, the clothing of men known to have lice. In this way they can increase the number of men for baths to about 600 per day. Where every garment is passed through the steam chamber only about 300 can be handled daily.

This is an ideal bathing and delousing plant, being made in a double walled canvas hut 50 by 35 feet made into sections that can be moved very easily. Floors are of wood and in sections. The steam disinfector is on a truck, as is the furnace and steam boiler; on top of the disinfecting chamber is a 100-gallon tank in which the hot water from the steam boiler is mixed with cold water, for the bathing showers. The furnace uses about 600 kilos of coal on the busiest days but generally only about one-half this amount is necessary.

The personnel required to operate this plant is usually about ten men, but may be increased where it is necessary to carry water any distance. If possible, they are located near a stream where a pump can be installed to furnish water. Steam from the disinfector's boiler operates this pump.

The French claim that one bath per week is sufficient to keep a man free from lice. At present the men get two baths during the nine days they are at rest, but none while in the line nine days or in support nine days. This can be handled very easily if one of these stations can be sent far enough forward to bathe the men in support.

Captain MacGruer, dermatologist, reports as follows on the method employed in the 26th Division, A. E. F., in delousing and bathing:

May 6, 1918.—Spent this day with Lieut. Sprague, sanitary officer. We first visited bathing and delousing station No. 3 near Boucq. This establishment was given by the American Red Cross and consists of two small tortoise tents in which the clean and soiled clothes are kept; one Bassoneau tent in which personnel live and

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for men who are sent to bathe to lounge while waiting turn in bath—also contains a barber shop. The bath tent is arranged so that men enter at one end of tent where there are nine benches with two numbers on each side of bench, total 36. The soldier undresses and puts his clothing in a large net bag on which is a numbered tag; he also receives a small bag in which he places his valuables. He then enters shower room at each end of which there are open lockers in which he places his bag of personal belongings and also shoes. After bathing he enters room at other end of tent, and at seat with corresponding number of seat in first room finds his clothing which has been disinfected, or else is given a new outfit. This bath has twenty shower heads so that forty men can bathe at the same time. Large Geneste-Herscher disinfector which opens into bath, undressing and dressing rooms, fired from outside building. This bathing and delousing station is centrally located for the division, accessible to nearly every unit. It is kept up in good shape, clean, and personnel very interested in work. Lieutenant Sprague, by using trucks and with thirty men in truck, for transporting men just out of trenches, put 600 through in one day. Capacity is at least 1,200 a day. Lieutenant Sprague is also accumulating clothing at this station and will receive about 5,000 suits for distribution here. Old clothing to be disinfected, laundered and returned for reissue. Personnel bathe and delouse every other day. Ordinarily men given eight minutes to undress, four minutes to bathe and eight minutes to redress. With hot air applied to clothing after steam disinfection and clothing shaken out in air they are nearly dry.

It has been the aim of the department to establish methods of prevention against the louse by having in each brigade of every division a large bathing and disinfesting establishment where the men are brought by organizations, not part of organizations, at least once each week, when not in the line. A commissioned officer accompanies each organization to the bath for the purpose of maintaining discipline. Each soldier brings with him his blanket and such equipment as can be disinfested by steam. At the bath all of his clothes are disinfested and the man receives a shower bath of hot water and soap. He receives a clean suit of underwear and socks, and also clothing if his other clothes are torn or unfit for use. His soiled, disinfested clothing is laundried and returned to the bath house for reissue. It is also being arranged to have a trained sergeant at each such establishment to differentiate scabies and pediculosis so that every soldier with scabies or severe skin lesions, such as the pyodermias, will be sent to the division skin hospital for appropriate treatment.

Frequent Skin Inspections.—Inspections of this character are absolutely essential, chiefly to detect scabies and lice within a few days after their development. Inspection of the skin should be painstakingly carried out at each bi-monthly venereal examination. For a thorough examination in this regard, the shirt should be raised to the shoulders and the trousers dropped to the knees. By this method the parasitic skin diseases can be discovered in their incipiency and rapid cure may be effected.

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Parasitic skin diseases should be reportable, the same as venereal conditions, so that exact account may be kept, which, and in what manner, various organizations have fallen down in their prophylaxis measures.

The success of this department in the prevention of skin diseases is largely due to the excellent General Orders which have been issued: G. O. 34 dealing with prevention, G. O. 38 in reference to bath houses, G. O. 13 dealing with laundries and clean clothes, and G. O. 215 regarding the holding of venereal cases in France and a physical examination for lice and scabies.

FRANCE, *September* 17, 1917.

General Orders,
No. 38.

2. Bath Houses. A bath house approximately 26 x 22 feet with a concrete floor, containing a dressing room and a bath room with from eight to twelve shower heads is authorized together with the necessary arrangements for heating the same, for each battalion area.

FRANCE, *January* 21, 1918.

General Orders,
No. 13.

1. The Quartermaster Corps will provide and operate laundries to do such laundry work as may be essential for troops in the Zone of the Advance and for patients in hospitals wherever located, including nurses' and doctors' caps and aprons. This work will be done without charge.

2. All garments laundered will be sterilized, washed, repaired and re-issued, no attempt being made to return to the soldier the identical garment he turned in.

3. Complete outfits of clean clothing will be issued to front line troops after leaving the trenches, and using the bathing facilities authorized by G. O. 38, H. A. E. F., 1917.

4. No laundry work will be done for troops not serving in the Zone of Advance.

5. Organizations moving into the Zone of Advance will take with them their portable shower baths, to be installed in suitable shelters, with the least possible delay after arrival. Engineer troops when available should make the necessary installation.

FRANCE, *November* 25, 1918.

General Orders,
No. 215.

1. Officers and enlisted men returning to the United States will be subjected to a physical examination previous to embarkation, and all those found to be affected with venereal disease in a communicable stage will be detained and placed in segregation camps.

In concluding this report I wish to pay a tribute to the senior consultant of the department, Col. Hugh H. Young, and to Col. Edward L. Keyes, Jr., consultant in urology. This department was started under peculiarly trying circumstances, organization being required in a strange land for a constantly growing army. Colonels Young and Keyes have striven early and late, and their enthusiasm has been an incentive for all those in the department.

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Conclusions.—The Section of Urology of the American Expeditionary Force has had charge of one of the greatest problems of the war.

War skin conditions differ from those in civil life in the difference in distribution of the eruption of scabies; the fact that the body louse lays its eggs on the axillary, pubic and perineal hairs, in addition to the usual sites; the severity of the complications of the animal parasitic conditions; the unusual types of impetigo and ecthyma; and the prevalence of flea-bites.

It has been estimated that animal parasites caused between 80 per cent and 90 per cent of all diseases in the various field armies. According to a conservative estimate, 95 per cent of the soldiers who had been at the front for six months or more showed lice.

Percentage figures on scabies show tremendous variations.

Divisions of the American Expeditionary Force, in active fighting, rarely showed more than 1 or 2 per cent of scabies, and frequently considerably less.

Approximately 40 per cent of all skin cases requiring treatment in the A. E. F. were diagnosed as scabies.

Scabies, if discovered within three weeks after its onset, can be cured in a maximum of four days. If scabies, or pediculosis, is allowed to go untreated for a longer period than three weeks, secondary complications, such as the various pyodermias, develop and cure will take a minimum of one month.

Pyodermia in the A. E. F. was held to a minimum of cases; there were but few requiring hospitalization. This contrasted tremendously with the records of our allies, who had thousands of hospitalized pyodermic infections. It should be stated, however, that preventive measures instituted in the A. E. F., were unusually effective for several reasons.

1. The U. S. soldier was fresh in the struggle and had not been worn down by four years of trench life.

2. The resistance to organisms was at the highest possible point.

3. The digestive apparatus, including the mouth, was in excellent condition, likewise raising the resistance to disease.

4. The mud of Flanders, containing large numbers of the streptococcus foecalis, was not a contending factor.

5. The American Army as a whole fought in a war of movement and was not subjected to the resistance-lowering winters in the trenches.

The solution of the problem is disinfestation of clothing and blankets, bathing, chemical repellants, laundries, and frequent skin inspections.

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A minimum of two disinfectors and bathing machines of the Foden-Thresh or Geneste-Herscher type are necessary for each division. The mobile disinfestor, manufactured by the American Sterilizer Co., is applicable for the use of base and camp hospitals.

The dry-heat apparatus, designed by Jacobs, is an adjunct to the other disinfestors for the delousing of perishable articles, such as leather and rubber goods. This apparatus is chiefly practical in non-mobile units or in areas permanently occupied.

The N. C. I. (naphthalin, creosote, iodoform) powder certainly assisted in the eradication of lice when freely and frequently employed.

Bi-monthly skin inspections are essential so as to detect animal parasitic disease in its incipiency.

The examination for venereal and parasitic diseases, every fifth day, at the embarkation camps in France should have had an excellent influence in guarding against a tremendous influx of these cases into the United States.

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METHOD OF HANDLING VENEREAL DISEASES AT CAMP DIX, N. J.

By Captain CHARLES H. DeT. SHIVERS, M. C., U. S. A.
Chief of the Urological Department, Camp Dix, N. J.

(Concluded)

PASTED on the wall of each treatment room are rules to be followed in regard to sterilization; and during all our thousands of treatments we have no record of being responsible for the extension of infection due to unclean instruments. The rules for sterilization in this department are as follows:

No. 1. Officers in this department must not allow their orderlies to carry out the treatments.

No. 2. In each treatment room there must be four white enameled basins, one containing cold sterile water, one on the sterilizer with boiling water, one with a solution of mercury cyanide 1–5000, and the other a solution of bichloride 1–5000.

No. 3. Soft rubber catheters must be boiled for ten minutes (several will be in use at one time), they must be taken from the boiling water with sterile thumb forceps and placed in cold sterile water until used.

No. 4. Soft rubber catheters for use are to be taken from the cold sterile water with sterile thumb forceps and, while holding the end of the catheter with the forceps, it should be run through the lubricant. The assistant washes the patient's glans penis with a 1–5000 bichloride solution and wraps a towel soaked in the same solution about the scrotum and shaft of the penis; the end of the catheter is then introduced into the meatus. Catheters are to be touched with the fingers as little as possible. All posterior treatments must be preceded by anterior irrigation. The metal urethral nozzles used for anterior and through-and-through irrigations must be kept in boiling water, then placed in cold sterile water before using.

No. 5. Hard rubber or woven catheters must remain in the mercury cyanide solution all through the treatment hours and, when used, they will be removed by the thumb forceps and used as are the soft catheters.

No. 6. In the basin containing the bichloride solution there will be cotton and gauze for wiping off the glans penis, etc.

No. 7. Officers will wear white gowns and rubber gloves at all times. These gloves will be boiled each evening for ten minutes and during the treatment hours will be soaked in a bichloride solution 1–5000.

No. 8. After massaging the prostate and vesicles, finger cots are to be wiped off with tissue paper, removed from the finger and handed to an orderly in charge of the sterilization, who will place them in boiling water for five minutes and from there to a 1–5000 bichloride solution where they will remain until used. A large number of finger cots will be in use at one time to allow proper sterilization.

No. 9. Lubricant will be placed on sterile gauze in each treatment room. The officers and enlisted men are not to bring their hands in contact with this lubricant (for use with catheters and sounds only). Sterile vaseline will be used to lubricate the fingers when prostatic or vesicular smears are called for. This lubricant will also be placed on a piece of sterile gauze.

No. 10. Hard rubber or woven catheters are to be used only when it is impossible

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to pass a soft catheter through the compressor urethrae muscle as the result of spasm.

No. 11. All metal instruments will be boiled for ten minutes before using.

No. 12. Instruments injured by boiling will remain in a 1–20 carbolic solution for one half-hour. They will then be put in a 95 per cent solution of alcohol and thoroughly rinsed, from here the instruments are placed in a 1–5000 mercury cyanide solution where they remain until used.

No. 13. There will be an orderly assigned to each treatment room who will do nothing but attend to the sterilization. His hands must be washed at frequent intervals, he must wear a white gown and rubber gloves, and these gloves will be sterilized as explained above.

No. 14. All officers examining new cases must sterilize their gloves in a 1–5000 bichloride solution between each patient. The parts are not to be handled unnecessarily; the patient is to retract his own foreskin and make pressure on his own urethra.

The cystoscopic work is done in the afternoon. At times we have a large number of cases reporting for this work. We require as indications for cystoscopic examinations: (1) Nocturnal incontinence (2) hematuria, (3) passage of calculi, (4) chronic pain referable to the genito-urinary tract, (5) frequency, (6) persistent cloudy urine, (7) loss of or impaired sexual powers, (8) painful or bloody ejaculations.

A great many cases are sent to this department who give a history of enuresis from childhood. As a rule these soldiers are light complexioned, and their history will show that there may be one or two in their immediate family suffering from the same condition. Most of their relatives thus affected are males. On cystoscopic examination about 75 per cent of these cases will show a trabeculated bladder, running from a slight condition to marked trabeculation with false diverticuli. The trigone is elevated and the bladder as a rule contracted, depending of course upon the extent of involvement. The other 25 per cent, giving a history of enuresis, have, on cystoscopic examination, normal bladders. In none of these cases did we find any obstruction in the urethra. Their bladder muscle hypertrophy may be due either to the frequent emptying, or the muscles controlling the neck of the bladder may not act in accord with those composing the rest of the organ. We have on record one case of enuresis that did not exist from childhood, nor does it date back to any gonorrheal infection. This is in a young man twenty years of age who gives a history of nocturnal incontinence dating back fourteen months. Prior to that time his history was absolutely negative, frequency of urination being first noted when he was ordered to the front line trenches; and the condition has existed since that time. At present he urinates every little while and wets the bed most every night. The cystoscopic examination showed a markedly trabeculated bladder, especially on the posterior wall and just above the trigone. The bladder

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was also contracted holding only 200 c.c. of fluid, otherwise his physical examination was negative. There was no notation on his service record of "shell shock." This case is of interest if we can believe his previous history, as it shows a possibility of frequency of micturition playing a part in bladder muscle hypertrophy. Very little is known about the etiology of these cases. It is possible in this case, as in the others, that the muscles controlling the neck of the bladder do not completely relax as the body muscles contract, thereby causing obstruction to the outflow of urine, which the bladder must overcome when emptying. None of these cases had spinal syphilis. But in any event there may be a cord lesion. We have also found in our work several cases of renal and vesicle calculi, some benign growths of the bladder (papilloma), and a few cases of renal and bladder tuberculosis.

We took for a matter of experiment 200 cases of chronic recurring gonorrhea which gave a history at one time or another of frequency of urination and cystoscoped them before they were discharged from this department. We found in some an active trigonitis; in other cases the trigone showed the result of an old chronic infection. The percentage of those involved amounted to 33.09 per cent. There have been a few cases in which we were able to demonstrate that the trigone was the cause of the recurrence.

It has been a subject of dispute among physicians as to how long cases suffering from acute and chronic gonorrhea should be kept under treatment, and what should be demanded of them before a cure is pronounced. We had the opportunity of studying 1,000 chronic cases showing prostatic and vesicular involvement, using the Gon. Comp. Fix. Test as a guide. We found this test would become negative from six to eight weeks following the disappearance of the organism from the smear. The gonorrheal anti-bodies are supposed to disappear from the blood in two to six weeks after the destruction of the organism. Following this observation we made it a rule to require in these cases of deep infection six negative prostatic and vesicular smears with not more than five pus cells to the field in the last three smears, also running up to a suitable size sound to express the content of the urethral glands and to act as a mechanical therapeusis whereby old inflammatory infiltrations are made to disappear through a reaction in the tissues.

It is interesting to note the result of gonorrheal infection in the Florida negro. We had the opportunity of studying 2,000 of these cases. The history of the infection generally dates back to the time they were first able to have sexual intercourse. We found in a great many of these cases the result of a Neisserian infection and were able to demonstrate the intracellular organism in a lower percentage of cases than in the

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corresponding infections in the white man. This type of negro seems to possess some natural immunity, as his infection is never as acute as the white man's. On examining the prostate we find that organ to be smaller and the vesicles larger than the white man's. The vesicles in the negro are more often involved in gonorrheal infections; he also suffers more with rheumatism than the white man. We find more strictures in this same class of cases, the large majority of these soldiers never having received any kind of treatment before coming to this camp. The strictures are multiple and were found 2½ inches from the meatus, or in the bulbo membranous urethra. There is fear existing among some physicians that the passage of sounds in cases of chronic gonorrhea is a bad practice on account of traumatising the urethra with the formation of a stricture. This is incorrect, as we found that a sound properly passed at the correct time did not in any case injure the urethra.

In the early stage of gonorrheal joint involvement we find an acute synovitis, and it is during this stage that the most good can be done for our patients. We found the majority of these cases were suffering from chronic gonorrheal vesiculitis plus prostatitis. We have noticed soldiers coming from other camps with joint involvement who had been under the vaccine treatment with very poor results. We feel that the condition in the joint is due more to the action of toxins than to the presence of the actual organism. Cases have been noted that have had free urethral discharges for months, with vesicular involvement and acute joint conditions. They had been under treatment in the base hospital, splints had been applied to the joints, and anterior irrigations given. Posterior treatments were avoided on account of a copious urethral discharge for fear of additional acute complications. We took some of these cases that had been existing for several months, kept them in quarters and gave them through-and-through irrigations twice a week with silver proteinate one-half per cent solution and light vesicular, and prostatic massage. Our results in most of these cases were excellent, the joint conditions clearing up in a few weeks time, showing the importance in all cases of gonorrheal joint involvement of first clearing up the foci of infection. It is possible that vaccines do good in certain selected cases, especially if the right strain is used. The cases showing chronic joint involvement of long standing we could do very little or nothing for, because we were dealing with end pathology of permanent changes in the joint.

Most of the cases of gonorrhea we have had to deal with in the army were of a number of years standing; some had as high as five or six separate attacks. It was interesting to note in going over their histories how few of these cases had received the proper treatment in civilian

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life, even those who really expressed a desire to be cured. Their treatment had consisted mostly of anterior irrigations, internal medication or through-and-through irrigation of the urethra alone. It was surprising to see how few cases with prostatic involvement had received the proper treatment; approximately one case in every five hundred. A great many of these infections were claimed to have been cured in the anterior urethra. We have seen in this camp a great many thousand cases, both at the base hospital and in the camp department, but have not seen one case where we can prove the gonorrheal infection has been confined to the anterior urethra; and most of the cases that had been apparently cured by doctors in civilian life in the anterior urethra we were treating after they entered the army. Mention might be made here of the relation of recurring gonorrhea as acute exacerbations to the taking of the typhoid inoculation, especially when it was given in a saline medium where the absorption was rapid. We have also seen a considerable number of peri-urethral abscesses following the typhoid inoculation, showing the urethral glands had been involved and an overgrowth of epithelium had blocked the outlet, and by some action of the typhoid vaccine the organism had been stimulated to renewed activity. Another thing of interest in those cases that were confined to their beds in the base hospital is that we found some that would develop epididymitis while flat on their backs and on a milk diet. Other cases of urethral discharge would be prolonged over a long period. We watched these cases very carefully and found that a number of them were chronic masturbators, by this causing a continued congestion of the parts which predisposed to further invasion. Statements have been made that it is unnecessary to treat the prostate unless the patient suffered from subjective symptoms which pointed to involvement of that organ. We found gonococci intracellular in quite a few prostates where the patients had absolutely no subjective symptoms. It seems almost impossible to have involvement of the prostatic urethra without having some infection extending to the prostate, as there are from forty to sixty prostatic ducts situated in the prostatic sinus on either side of the verumontanum. The infection extends, involving the neck of the bladder, and in many more cases than was formally supposed the trigone is involved.

It takes approximately three months before we can discharge our acute cases as cured. The acute cases report to this department once a day for a copious anterior irrigation. In the early stage of the disease they are given five minims of sandalwood oil three times a day, and during the declining stage copaiba and urotropin. Smears are made from their urethral discharge twice a week. Their subjective symptoms are carefully noted each day when they report for treatment. If the burning

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on urination increases we decrease the strength of the solution; if, on the other hand, the number of pus cells and organisms increase, as shown by the smears, we increase the strength of the solution, providing the subjective symptoms do not contraindicate its use. When the organisms become extra-cellular, the pus cells decrease in number with an increase of the epithelial cells, showing that the healing process is going on. Then we give the patient solution "4," which is an astringent consisting of two grains each of copper and zinc sulphide in 8 ounces of water, which he is instructed to inject into the anterior urethra three times a day, following urination, and to hold it there for five or ten minutes. He reports as usual for his silver irrigation to destroy the remaining gonococci (it is better in the acute cases to allow the patient to inject a silver solution in the anterior urethra following each urination, besides his daily copious irrigation. This we could not satisfactorily carry out in camp because a great many of the patients would fail to take their injections). At the end of the fourth week, providing the patient is doing nicely, we start our through-and-through irrigation twice a week. The prostate and vesicles are never examined in these cases before the sixth week, sounds are never passed until the discharge and urines clear up, which averages about six weeks. If the patient shows prostatic involvement at the end of the sixth week, we require six negative prostatic smears and pass suitable size sounds before we discharge the patient as cured. One vesicular smear is made in the early stage of the posterior treatment, and if that is negative the vesicles are not examined again until just a week before the patient is discharged. This second examination is to assure us that the vesicles have not been involved during the latter part of the infection. If they show infection, we require the same number of negative smears as we do from the prostate. All massages are followed by copious irrigations of the entire urethra; all sounds are preceded by irrigation of the urethra, filling up the bladder with a silver solution, which the patient passes following the administration of the sound.

It takes on an average of ten weeks to clean up a case of acute exacerbation of chronic gonorrhea, providing the vesicles are not involved. These cases receive copious anterior irrigations for at least two weeks before the through-and-through treatments are started. The examination and treatment of the prostate and vesicles are begun at the end of the fourth week, providing there are no contraindications. Chronic gonorrhea, with involvement of the posterior urethra and prostate, takes from eight to nine weeks to cure. Posterior treatments twice a week are started immediately, giving one treatment of sounds and irrigation, and the other of prostatic massage with irrigation. The same number of

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negative smears are required before discharging these cases. Patients with posterior urethritis of long duration do best on instillations of a 1 to 2 per cent solution of silver nitrate to the posterior urethra once a week. The Kollmann posterior dilator is of great value in those cases, showing submucus infiltration. Local application through the endoscope also does good in these chronic cases. Instillations once a week of a 1 to 10 per cent solution of silver nitrate to the trigone of the bladder is the treatment of most value in gonorrheal trigonitis.

We found the following drugs of almost equal value in the treatment of acute gonorrheal urethritis: (1) Silver protinate, ½ of 1 per cent solution, (2) potassium permanganate, 1–5000, and a new preparation recently put out by the Polyclinic Hospital Laboratories of Philadelphia called mercurophen, which is known chemically as "Sodium Oxy-Mercury Ortho-Nitro Phenolate" containing 53 per cent of mercury. Probably the last-named product is superior in its germicidal effect to the other two drugs. There seems to be a more rapid decrease in the number of pus cells and an earlier disappearance of the gonococci from the cells when it is used. In chronic gonorrhea we have used mostly the silver protinate ½ per cent solution; also silver nitrate 1–10000, and the mercurophen 1–5000. The silver protinate and the mercurophen cause less irritation than the silver nitrate, and the end result apparently is just as effective. The mercurophen does not coagulate the albumin in the tissues except to a very minute degree, therefore its irritative properties are very slight.

From June 24, 1918, until February 1, 1919, the records of this department show the following number of cases examined and treated for each month, with the percentage of complications:

	No. cases examined	*No. of treatments given*	*Per cent of complication*
July	1,041	2,526	0
August	2,909	6,655	5/100 of 1%
September	2,606	13,195	11/100 of 1%
October	2,891	23,085	5/100 of 1%
November	2,061	19,775	4/100 of 1%
December	338	2,364	16/100 of 1%
January	178	1,511	13/100 of 1%
	12,024	69,101	

The majority of complications were cases of acute epididymitis. I have not seen one case in this camp of acute prostatic infection that did not respond to palliative treatment, nor have I seen a case of ruptured prostatic abscess.

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The following are monthly reports from our laboratories, with a grand total for the seven months, including urethral, prostatic and vesicular smears, urine analysis, and animal inoculations:

July, 1918	2,035 reports
August, 1918	5,385 reports
September, 1918	7,713 reports
October, 1918	13,604 reports
November, 1918	14,665 reports
December, 1918	1,743 reports
January, 1918	758 reports
Total	43,903 reports

We have in the Camp Urological Department 115 enlisted men. There is one first-class sergeant in charge of these soldiers, and a sergeant or corporal at the head of each building acting under his orders. The enlisted men work as clerks, assistants, orderlies, traffic policemen and guards. Each physician is assigned one or two of these men to help with his work. The buildings are never closed, and two enlisted men are on duty in each building throughout the night. The hours of work are from 7.30 a.m. to 4.30 p.m., although they have often been kept much longer than that during the busy months.

There are 24 officers on duty in this department. A captain is in charge on each building who is directly responsible to the chief of the department, and has as his assistants either captains or first lieutenants. The hours of duty are from 8.00 to 11.45 a. m. and from 1.00 to 4.30 p. m. Certain officers are assigned night and week end duty. The physicians of this department have a meeting every Monday evening at 7.00 p.m., where papers on genitourinary subjects are read and discussed by the various members.

The list below gives the total number of soldiers examined and the number under active treatment in this department from June 24, 1918, until February 1, 1919; also the number of acute and chronic cases:

(*a*) Number of soldiers under active treatment	6,934
(*b*) Number of soldiers examined	12,024
(*c*) Number of cases infected after entering the army	119
(*d*) Number of cases that were chronic before entering the army	6,815

The following is a report compiled from a series of 2,907 cases; 1,391 of these cases were white, and 1,516 colored:

(*a*) Complications, epididymis (left side, 31; right side 15), 46 cases or (per cent)	1.8
(*b*) Prostatic involvement, total (white, 1,263 cases; colored, 1,485 cases), by palpation and smear or (per cent)	98

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(*c*) Strictures of the urethra (white 120 cases; colored, 176 cases), total 296 cases or (per cent)	10.1
(*d*) Average time of urethral discharge in the acute cases (white, 28 days; colored, 29 days), average (days)	28½
(*e*) Average time of urethral discharge in the chronic cases (white, 18⅗ days; colored, 14½ days), average (days)	16⅕
(*f*) Average length of time to cure acute exacerbation of chronic gonorrhea (white, 65 days; colored, 64 days), average (days)	64½
(*g*) Average length of time to cure chronic gonorrhea (white, 66 days; colored 53.02 days), average (days)	69.06
(*h*) Chronic cases showed gonococci intracellular in the following number of cases (white, 37.1%; colored, 26.8%, average per cent)	31.7
(*i*) Numbber of recurrences (white, 6; colored, 0), total cases	6

Our records on vesicular involvement are not given here, due to the fact that some of the officers were inexpeieced and the observations made on these cases were not always correct. But we can safely state that the most common parts of the genitourinary tract to harbor the gonococci is, first, the prostate gland, next in importance are the vesicles, then come the urethral glands.

After the signing of the armistice a large number of soldiers suffering from venereal disease were transferred to their home camps, where the treatments were completed. This cut down to a large extent the number of cases we would have eventually discharged. However, the Camp Urological Department was able in seven months' time to discharge as cured 4,264 soldiers. Only thirty cases were discharged where recommendations were made for domestic service.

It is interesting to note that at the present time we have so few cases of venereal disease in Camp Dix. As you have seen by the foregoing figures, most of the cases that have been examined and treated in the Camp Urological Department were contracted prior to enlistment. The main reason for the enormous cut in the venereal rate of the Army has been largely due to the proper use of the prophylaxis. Taken in time and efficiently used we can truthfully say it is almost a positive preventive. This same prophylaxis should be applied in civil life, for it is much easier and safer to prevent the development of an infection than to cure one after it has once developed. The best results are obtained one hour after exposure and the percentage increases as the time goes one; but we have found that the results have been very good if the treatment is taken within eight to twelve hours after exposure.

We were so busy with our gonorrhea cases during the late summer and early fall that it was the latter part of October, 1918, before we were able to take over for treatment the ambulatory cases of syphilis. On

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and after October 30, 1918, all cases of syphilis were ordered to report at the Camp Urological Department, Building No. 3, for diagnosis, disposition and treatment. All cases with open lesions are sent to the base hospital until their condition is cleared up, when they return to the camp department to have their treatment continued. Cases of syphilis are not retained in venereal battalions, and are on full duty except those cases following the administration of salvarsan, which is given in the afternoon when they receive quarters until the following morning at reveille. These cases are eligible for discharge from the Army within four weeks after their lesions have completely healed. Before the armistice was signed cases of syphilis that had not had open lesions for a period of two months would be sent across with their regiments, although treatment for the disease would be continued throughout their stay in the Army.

Syphilitic cases reporting for examination come between the hours of 8 and 11.45 a. m., and those for treatment between the hours of 1 and 4.30 p.m. The paper work, with the exception of the standard syphilitic register, is not different from that used on the gonorrhea service. A complete history is taken of all cases uuder treatment, careful examination is made of all viscera, and a urine analysis precedes each injection of salvarsan.

Those cases of recent open lesions returning to this department from the base hospital receive six injections of salvarsan one week apart, giving one decigram to 30 pounds of body weight, and the first dose given is one-half of the normal dose; 25 c.c. of water being added to the decigram, and after the sixth injection a thirty-day mercury rub is given, examining the urine twice each week. At the end of the month the patient receives one week's rest, then a course of thirty more mercury inunctions. We then wait four weeks and have a Wassermann taken, and if the Wassermann is positive the salvarsan and mercury are repeated, but if negative we simply repeat the mercury. It is very seldom that cases are held after this time elapses on account of transfer to other camps and discharges from the Army. If a patient remains with us at the end of the second course of treatment we give a rest of two months, and then the third course of treatment in accordance with the Wassermann. During the second year if the Wassermann remains positive we repeat the complete course of treatment with intervals of two months rest. If the Wassermann is negative during the second year we give two courses of mercury treatments with four months intervals. The Wassermann should be taken at six months intervals during the third year. If one cares to give a soluble preparation of mercury hypodermatically, one-fourth of a grain of bichloride of mer-

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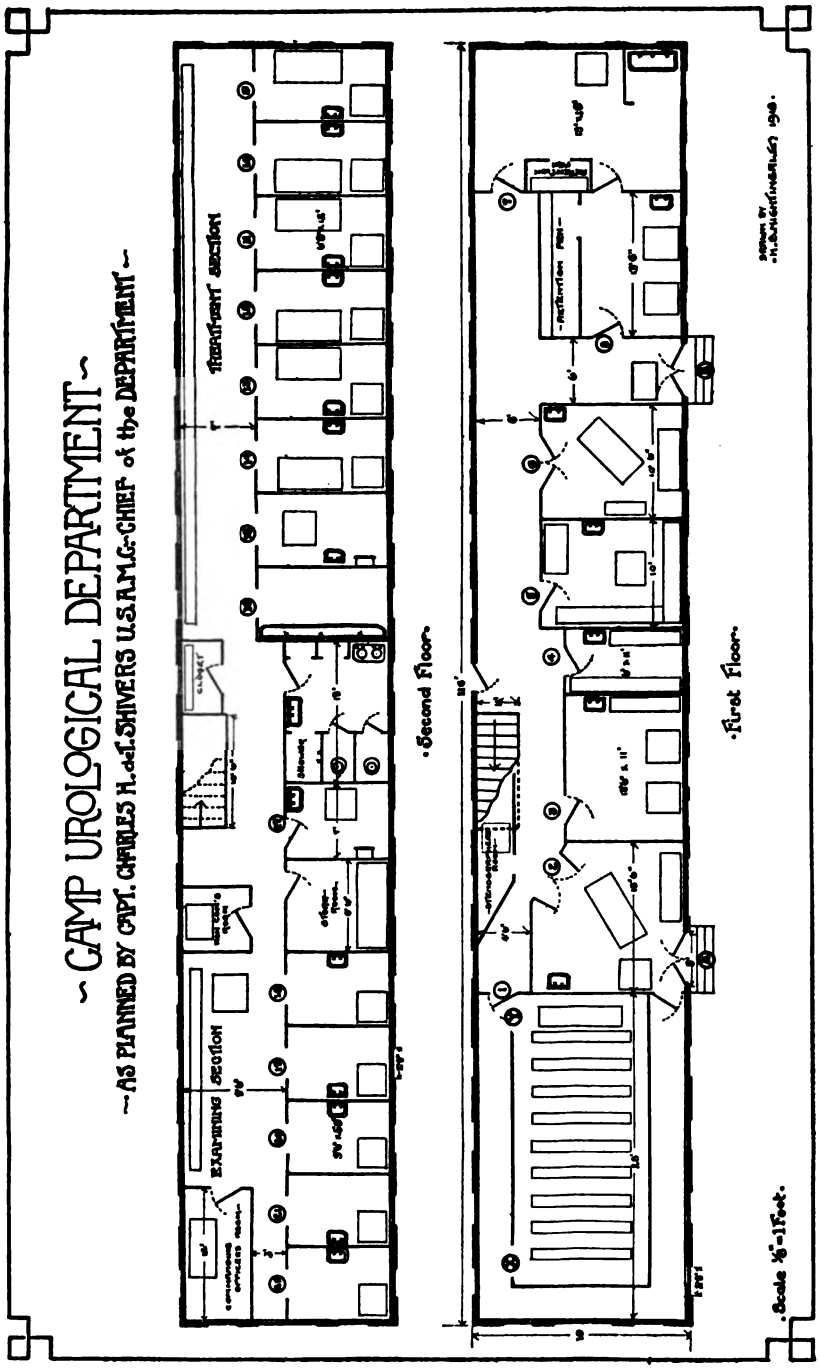

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cury can be given in sodium chloride solution every second day for twenty-four or thirty injections. If an insoluble preparation is used, salicylate of mercury can be given in the buttocks once a week for nine or ten injections. The insoluble preparation of mercury is the most dangerous on account of its cumulative action. In tertiary syphilis potassium iodide should be given with the mercury, five to ten grains three times a day.

For men reporting here for their first examination with open lesions, dark field examinations are made on every cases. If we are able to secure the patient just as the sore is breaking down, the spirochaeta-pallida can be demonstrated in most of the cases. All cases of primary syphilis and those with suspicious lesions are sent to the base hospital for further study and treatment.

We have been very well pleased with the arsenobenzol manufactured by the Polyclinic Hospital Laboratories, Philadelphia, and with all the thousands of treatments that have been given in this camp we have not seen one serious result from its use, and its effect upon the progress of the disease has been most gratifying.

In closing this article I wish to express my deep appreciation for the valuable assistance given me by Captains R. A. Sempill, Samuel A. Buchenholz and E. H. Harsh, also Lieutenants R. E. Weaver and James C. Staats.

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REPORT OF A CASE OF CEREBELLAR ABSCESS FOLLOWING SHELL WOUND OF SKULL AND SHOWING NO SYMPTOMS FOR PERIOD OF FIVE MONTHS

By Lieutenant FREDERICK THAYER HILL
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THE diagnosis of cerebellar abscess generally presents difficulties under the best conditions. With the classical signs and symptoms present in sufficient number to confirm the diagnosis there is usually a great element of doubt which is only dispelled by the revelations of the operating or post-mortem rooms. Then indeed does the old axiom, "Hindsight is better than foresight," come to be truly appreciated. With all the evidence before us the formerly obscure and puzzling case seems indeed plain enough.

This case, resulting from a shell fragment penetrating the skull, presented some unusual features obscuring the diagnosis. Of special interest was the long period of latency, without signs or symptoms, as well as the absence of any pathology in the fundi. It was complicated by having had a trephine performed some months previously at the time of his injury and this, undoubtedly, had considerable to do with the lack of signs later.

In the classical case of cerebellar abscess we look for headache, especially occipital, apathy, slow pulse, tenderness and stiffness of the neck, ataxia, vertigo and disturbances of equilibrium, emesis, nystagmus to the diseased side and fundus changes. This case exhibited apathy, headache, both frontal and occipital, nystagmus to both sides and varying at times, and very little vertigo and emesis. Attention was distracted from the cerebellum and directed to the mid-brain by the fact that the course of the shell fragment had been traced through the tempero-sphenoidal lobe to where it was removed just above the occipital protuberance. Apparently there had been no invasion below the tentorium. At the time it seemed from both the history and the clinical picture that the mid-brain area was the more logical site of the trouble than the cerebellum. Without doubt we were unduly impressed with this picture as it appeared to us and did not lay sufficient stress upon what at the time seemed insignificant and otherwise easily explained symptoms.

The patient was a young white man, aged 23, and by former occupation a farmer. He was admitted to U. S. General Hospital No. 14, January 16, 1919, as an ambulatory case. The family history was negative. Past history: mumps, whooping-cough and diphtheria in childhood, malaria six years ago. No history of tuberculosis or venereal

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disease. General physical examination showed a well-developed and well-nourished young man weighing about 150 pounds. He seemed in perfect physical condition except for a discharging left ear, with accompanying deafness. He was feeling perfectly well, complained of no headache or other untoward symptoms, and his gait was normal.

The history of his present trouble was as follows: October 2, 1918, in battle on the Champaigne front he received a penetrating wound of the skull from a high explosive shell. Patient was rendered unconscious and remained so for about six weeks, during which time he was operated upon in a base hospital. When he regained consciousness the wounds in the head and face had healed and the left ear was discharging. The notes of the operation at the base read as follows: "Removal of foreign body (shell fragment) a little above and to the left of occipital protuberance, three quarters of an inch in brain substance. One-half ounce of pus liberated. Necrotic brain tissue, drain, etc. Wound of entrance—large destruction of petrous portion of temporal. Drained through external auditory meatus. Great destruction of bone and brain substance." The foreign body had previously been localized by X-ray examination. Report of spinal fluid examination at this time was as follows: "Slight pressure straw-colored but not turbid. Cell count 49 per cm. No organisms." The white blood count was 29,160, and the differential showed 80 polymorphonuclear leucocytes.

Examination of his skull showed the following: A small wound penetrating the soft parts only, one inch to the outside of the outer canthus of left eye. A small shell fragment could be felt underneath the skin. The main wound of entrance was just above and anterior to the helix of the left auricle. Three inches posterior and parallel with the pinna was scar of the operation. A trephine opening about the size of a quarter of a dollar could be felt just above and to the left of the occipital protuberance.

The left ear had been constantly discharging since he regained consciousness. There was no pain, but he seemed slightly tender on deep pressure over the mastoid antrum. There was an atresia of the external auditory meatus about two-thirds of the way in, the canal being closed by granulation tissue which bled very easily. The discharge was of a thick purulent character. By means of a probe a sinus was demonstrated in the upper canal wall with bare bone at the bottom, apparently in the region of the attic. Hearing test was as follows: Conversation, one foot; Galton whistle, 0.3; low limit, 512 tuning fork; Rinné (512 fork), 8/10, Weber lateralized to the left. The right ear was normal. There was no spontaneous nystagmus or any signs of labyrinthine trouble.

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The X-ray examination showed some blurring of the mastoid cells but no bony occlusion of the external auditory meatus.

Because of the discharging ear and the occlusion of the canal, operation was advised and performed on January 24 by Lieut. Col. T. J. Harris under nitrous oxide and oxygen anesthesia. The operative notes are as follows: "Usual mastoid incision-cortex opened. Sinus found very far forward in relation to the bony canal wall. Dura low. Bone bleeding and necrotic. Because of bleeding and position of sinus it was impossible to make certain that all the cells were cleaned out. Portion of bony canal wall removed. Körner flap cut and wound partially closed with silk-worm gut. Iodoform gauze to cavity."

The wound was allowed to drain for a time and then to close. It healed in about four weeks, but the discharge from the canal persisted as before. Granulations were seen at the bottom of the canal. He was put upon middle-ear treatment consisting of alcohol and boric acid instillations. Patient was up and about and feeling perfectly well. He was out on pass on several occasions. During this time the small shell fragment just below the outer canthus of the left eye was removed under novocaine.

March 7, five months after his injury, the patient complained of a severe headache and was put to bed. He had been out automobile riding the evening before. There was some nausea accompanying this, but, as he said that he had overeaten, this was considered gastric in origin. Headache was continuous in varying degree from this time on. At first it was confined to the frontal region, but later it became occipital as well. The temperature was normal and remained so throughout the course of the disease. The pulse rate was 84.

March 9, headache persisted localized in frontal region. Reflexes all negative. Examination of eyes by Captain Hubbard: "Pupils equal and react to light and distance. Muscles O. K. No nystagmus. Fundi negative."

March 10, he felt somewhat better but still had headache. There was noted for the first time a slight first-degree horizontal nystagmus to both sides. Cochlea was functioning, conversation being heard at distance of 6 inches, using the Bárány apparatus in the right ear. There was no vertigo. Neck was not stiff or retracted. He seemed rather hyperesthetic over the whole head. Neurological examination by Captain Caldwell and Lieutenant Miller: "Neurologically shows no definite findings other than the equally hyperactive tendon and abdominal reflexes. Mental findings subjective. Distinct hysterical reaction. Advise further observation. "Medical consultation showed "no primary gastrointestinal condition."

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March 11, headache was occipital as well as frontal. He also complained of some pain in neck but this was not retracted or stiff. Patient seemed to prefer reclining on right side in a rather curled-up position. The examination of the reflexes was, as before, normal, except for some exaggeration of the tendons and abdominals. There was no change in the condition of his hearing. The discharge from the canal was rather profuse. Fundi were negative. The nystagmus continued as before, first degree horizontal to both sides. Pointing tests were all negative. There was no adiadokokinesis, dysmetria or asynergia. Seen in consultation by Major Raney, Chief of Surgical Service: "No evidence of intracranial involvement. No direct or localizing signs of pathology within head. Advise observation."

March 13, patient said he felt better. The headache was less severe. There was no vertigo, but he complained of "feeling weak." The nystagmus remained as before. The fundi were negative, the pulse rate 80. As his bowels were sluggish he was given magnesium sulphate, following which he was nauseated and vomited, the first appearance of emesis. Later in the day it was noted that he seemed drowsy and slept a good deal.

March 14, he felt better in the morning and ate a good breakfast. There was no nausea or vertigo. His hearing remained as before. A slight rotatory component was noted in his nystagmus for the first time. It was for the most part horizontal to both sides and only first degree, but there was added this slight rotatory movement to the left—the diseased side. We were unable to exclude a serous circumscribed labyrinthitis and deemed it advisable to keep the patient as quiet as possible to allow any acute signs to subside. It was considered best not to perform the fistula test, the result of which would have been doubtful in any case because of the condition of his middle ear. Following testing for nystagmus he complained of some nausea.

The next day there was no change. March 16, the rotatory component of the nystagmus had disappeared and was not seen again. He had some headache but not very severe.

March 17, his headache became very severe, requiring the use of opiates to give relief. He said that he was not dizzy, but was not disturbed to test for ataxia. The reflexes were all negative and the hearing, fundi and nystagmus showed no change. Some bulging was noted at the trephine opening and distinct pulsations felt. The pulse was 80. Testing for past-pointing without stimuli, he past-pointed to the left with the left arm but to the center with the right. Despite the pulse rate and the normal fundi we were undoubtedly dealing with a case of brain abscess, the location of which was a matter of grave conjecture.

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March 18, he was distinctly worse, being irritable and stuporous. The trephine area was bulging more markedly but distinctly pulsating. Temperature normal; pulse 84. White blood count, 8,500. Differential polymorphonuclear leucocytes, 81; small mononuclears, 13; large mononuclears, 6. Fundi negative. The discharge from the ear was very foul and profuse. After consultation with the neurological and general surgical services it was felt that operation was advisable and that a radical mastoid with exploration in the region of the tempero-sphenoidal lobe offered the best hope.

Operation performed by myself assisted by Lieutenant Miller. Nitrous oxide and oxygen anesthesia. Incision through the old scar. It was necessary to dissect away a great deal of scar tissue, especially where the Körner flap had been thrown back at previous operation. The antrum was opened and granulation tissue removed from the cavity. The sinus was found forward against the canal wall. The plate covering the sinus was soft and was removed over a wide extent. The sinus appeared normal. Dura was exposed over a wide area, and anteriorly and above the external auditory meatus was found an area of firm, apparently organized granulation tissue about the size of a dime, evidently the site of entrance of the shell fragment. The bone in the angle between the sinus and the floor of the middle fossa was very soft and necrotic and this was cleaned out. The tegmen antri, as well as the internal plater just inside the sinus and forming the posterior surface of the petrous, was found apparently somewhat shattered or factured by the shell fragment. However, the dura seemed all healthy everywhere. It was carefully examined and no leads were found at any point. The bridge between the antrum and the middle ear was quickly taken down and granulations removed from the latter. The patient's condition at this time made it advisable to halt the operation at this point. While we of course, strongly suspected an intracranial abscess we did not feel justified in further exploration at this time, but thought it advisable to wait for more localizing signs later. The cavity was packed with iodiform gauze and one silk-worm gut suture taken.

He reacted well from his operation and the following day seemed somewhat brighter. The headache was less severe. The wound was clean.

March 20, headache was still present, but not to a severe degree. He seemed considerably better. The nystagmus was less noticeable, still horizontal to both sides but easily exhaustible. The packing was removed from the operative cavity, which was clean. The dural surface was carefully examined for any lead of pus, but none was seen, and the cavity was lightly repacked with iodiform gauze. The bulging at the

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trephine opening remained as before. As this was always pulsating it was felt that there was no abscess at this point.

March 21, there was more bulging at the trephine area, but pulsations were still felt. Reflexes and fundi negative. The wound was clean, there being no pus from the ear. In the afternoon the headache became very severe, and after a consultation a lumbar puncture was performed, about 10 c.c. being withdrawn. The fluid was clear and only under the slightest pressure. Examination of this showed a positive globulin test and a cell count of 60. Following the lumbar puncture the pain became very intense, so that morphine had little effect in relieving it. In the evening the patient became delirious, and about five hours after the lumbar puncture he suddenly died.

Postmortem examination: Examination of the skull showed an irregular opening about 1 cm. in diameter through the squamous portion of the left temporal bone, the wound of entrance. About 1 cm. above the occipital protuberance to the left there was a trephine opening about the size of a quarter-dollar. The result of a recent radical mastoid operation was seen on the left temporal bone with the plate covering the lateral sinus removed over considerable area. Between this and the subarcuate fossa on the posterior surface of the petrous portion there was an irregular shaped opening about 1 cm. in diameter, either the result of a fracture or the pathway of a shell fragment. On its inner border there was evidence of callous formation, the internal margin being pushed backward some little distance, leaving a jagged angle protruding into the posterior fossa. This was thoroughly united. The tegmen of the antrum and posterior portion of the middle ear was missing, but the dura everywhere appeared healthy. The meninges were firmly adherent to the bone at the trephined area, and the brain substance at this point was slightly herniated. In the region of the longitudinal fissure the pia was adherent, and the cortex of the brain had a corroded appearance. Microscopic examination of the tissue in this area revealed the results of an old hemorrhagic process beneath the pia.

A fistulous tract, finger-size, extended from the wound of entrance through the left tempero-sphenoidal lobe to the trephine opening at the occiput, the main tract of the shell fragment. This was just lateral to the posterior horn of the lateral ventricle. Another very small fistulous tract was found extending from the first, backward to the left lobe of the cerebellum, where it opened into a large abscess cavity the size of a walnut. This cavity was firmly encapsulated and walled off, and filled with semi-solid white pus. The left hemisphere of the cerebellum was almost obliterated and what remained was very boggy, with all the natural markings lost. The cerebrospinal fluid obtained at this time was

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cloudy and increased in amount and was found to contain many pneumococci, type No. 2, atypical. The pus from the abscess contained staphylococcus albus. Autopsy performed by Lieutenants Smith and Heise.

Without doubt this abscess was of long duration. It was very firmly encapsulated and had practically obliterated the whole left hemisphere of the cerebellum. For the first six weeks following his injury the patient was unconscious, but from that time until thirteen days before his death, a period of about five months, he had no symptoms of cerebellar involvement, or, in fact, of any trouble other than the otorrhea. Whether the abscess developed insidiously, or was of rapid growth during the period of his unconsciousness, and compensation developed through the other half of the cerebellum taking on the functions of the destroyed half, it is impossible to say. It certainly would seem that such adjustment did take place. The remarkable feature of the case was the fact of this man going about for five months feeling perfectly well with this large destruction of his cerebellum. Some jarring incident to his automobile ride must have stirred up the latent process. His discharging ear, upon which our attention was so largely focussed, was simply coincident and had nothing in itself to do with his death.

The pulse rate was at no time slow, averaging 84. His temperature was always normal. There was no vertigo until the last few days, and then it was very slight. He showed no ataxia or disturbances of equilibrium, although in the last few days he was not disturbed to test for the same. Headache was the one ever-present sign, at first frontal in location and later during the last ten days occipital as well, but varying in intensity. The occasional nausea and emesis, occurring in slight degree at the onset and again on the seventh and eighth days, was of greater significance than we gave credit for. His slight first-degree horizontal nystagmus to both sides, especially with its shifting and inconstancy, according to Ruttin was suspicious of cerebellar trouble. The appearance of the rotatory component on the eighth and ninth days is difficult to account for and was instrumental in leading us to think of a labyrinthitis. Of course this element may have been present at other times than when under observation, simply a part of the shifting and inconstant nystagmus. Four days before his death he past-pointed to the left with the left arm, a direct sign of cerebellar involvement, but, as it seemed to us at that time, too indefinite to warrant exploration without more localizing features. His apathy and headache could have gone with a temporo-sphenoidal abscess and this, coupled with the known tract of the shell fragment through this area, made us feel inclined to so regard the case. If his condition had been such that it would have been

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a good surgical risk at his last operation, we would have explored the tempero-sphenoidal area and, failing there, would have turned our attention to the cerebellum and have undoubtedly discovered the abscess. It is almost certain, however, as subsequent events showed, that this would have been of no avail. His death sentence had already been signed, and it was too late for operation to have saved him. This was an example of hyper-conservatism. We waited too long, demanding too much in the way of localizing signs.

The time when operation offered the real hope of success was before the onset of these last more or less vague symptoms. The opportunity to have saved him was during the period when he was apparently all right or at the start of his manifested trouble, but the necessary indications were lacking. The wonderful compensation established by the other half of the cerebellum was a factor which served against him. The bulging at the trephined area, evident on the eleventh day, together with the headache and apathy, and the history of the case made it obviously a brain abscess, despite the atypical pulse and the normal fundi. The existence of the trephine without doubt was a factor in the maintainance of the normal appearance of the fundi. The inconstant nystagmus and slight vertigo, together with the ill-defined past-pointing phenomena, suggested the cerebellum as the site of the trouble, but at the time these were overshadowed by more evident signs. In the effort to be conservative exploration was deferred too long, until more localizing signs should be seen. The seemingly charitable thought not to disturb the patient in order to test for ataxia in the last few days, was probably a mistake, though there is still much doubt as to how much benefit it would have been to him. Of interest are the shifting and inconstant nystagmus and the past-pointing and the significance they have in a case of this kind.

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ONE PHASE OF THE MOSQUITO WORK CONNECTED WITH ARMY CAMPS IN 1918[1]

By C. S. LUDLOW

Army Medical Museum, Washington, D. C.

AMONG the various activities which developed during the war, none are perhaps more marked than those connected with the health of our soldiers.

Supported by an authority never before at its command, the Medical Corps of the Army has been able to control the subordinate branches and details in regard to sanitation and hygiene, with the result that the health of the Army has been of a quality not possible of attainment at any previous time.

It is not the province of this paper to enter into a discussion of these various branches, for even to mention them and designate their activities would take considerable time.

Probably most important is the subject of preventive medicine, the value of which, with its many subdivisions, it is almost impossible to exaggerate. Under this subject, as one of the small subdivisions, comes medical entomology and its closely related branch, insect control, which covers control of breeding places and adults, and protection of the men from insect attacks by various mechanical and chemical means.

The work of medical entomology, as connected with our Army, in respect to the study of mosquitoes, was being carried on, under the auspices of the Surgeon General of the Army, as far back as 1901, in the Philippines, and collections were taken at many of the posts and subposts in these islands, the work being vigorously pushed for some years, and in a less extensive way it is still in progress. Later, about 1905, one summer's work was done in the continental United States, and collections from various points have been received occasionally ever since. This research was done from the entomological standpoint, did not include any experiments in transmission, and was intended to show what mosquitoes were present at a given station and what diseases were coincidentally present, in this way serving as a suggestion where transmission experiments might be undertaken.

In the Philippine Islands this research was, of course, pioneer work, while that done in the United States, Hawaii, Porto Rico, etc., has merely given added information to that already obtained from other sources. The epochal work in Cuba had already been done, and the

[1] All the data given in this article, including the distribution of certain Anophelines, are taken from the records of army camps for 1918, and do not in any instance include any other records made by various authorities.—C. S. L.

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wonderful work in Panama, covering so many sides of the subject and done by a separate body of men, is of course unique in many ways and complete in itself.

Before going into any details of this study in medical entomology it is perhaps well to state what is believed to be its relation to the coördinate branch, insect control, which with the work in insect transmission seems to form the completed triad.

As any control work necessarily means a knowledge of the conditions to be controlled, so, in regard to mosquitoes, the identification of the forms present at a given station (post or sub-post) should be a preliminary and concomitant study, preceding and accompanying the control work throughout its whole course, otherwise much unnecessary labor and expense are likely to be entailed.

First of all it must be known whether the aim is merely a question of added comfort, or lessened discomfort, to the inhabitants of the locality, or whether increased health and efficiency are the definite results desired; and this, because the different groups of these insects vary considerably in breeding places, life habits, etc., and these are not the same even in different species of the same group, so that some initiative knowledge as to the mosquitoes present is desirable before control work is begun, and a contemporary study, running hand in hand with the control, should act as a sort of compass, indicating possible changes in methods and directions of attack, as shown by the species found to be present.

For this reason, and that the results might be recorded and correlated and so made available for future use by the Medical Corps, this research was instituted.

The work for the camps, cantonments and fields in 1918 was initiated by Col. D. C. Howard, Medical Corps, U. S. Army, in charge Division of Sanitation, Surgeon General's office, when he issued (March 21), "By Direction of the Surgeon General," a letter to the division surgeons stating, "It is desired that collections of mosquitoes be made in your camp and immediate vicinity" and directing that these collections be sent to "the Army Medical Museum for classification." Of course the "desire" of the Surgeon General, like a "request" from the President, is equivalent to a command and carries the same weight.

The necessary instructions for taking and mailing the insects, the boxes for collections, and wooden mailing boxes followed immediately, and these, with Colonel Howard's letter, were sent to fifty-eight stations by March 25, and the newer camps, cantonments and fields, as they were created, were supplied as promptly as possible, the total amounting to seventy-eight posts.

These instructions were quite complete and gave the period which a

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given collection was expected to cover and the hours of collection. The killer of preference was indicated, and how it should be made, and suggestions as to other killers and traps given. The places from which collections might advantageously be made were stated, and specific directions as to the care necessary in taking and mailing the specimens and for the marking of the collecting (pill) and mailing boxes were also given.

These methods had been tried out for several years in the Philippine Islands and the United States and proven successful. The choice of places where collections might wisely be taken was guided by the fact that disease-bearing mosquitoes are usually found in close connection with the living conditions of man, and sylvan mosquitoes are rarely connected with the transmission of disease. This may be illustrated by three significant collections from the Philippine Islands.

1. The best and most valuable collections of Anophelines ever received in this work, and which extended over a period of some months, were taken by Col. W. P. Chamberlain, M. C., at Camp Gregg, who tells me that he put the ward collections, mostly daytime, in the hands of reliable Hospital Corps men, but that by far the greater number of mosquitoes were taken at night, after the lamps were lit, when he personally collected from the outside of the screens of the porch of his quarters, and that he was able to take these insects in large numbers because the sound of the mosquitoes buzzing on the screens was "like the rushing sound of distant waves."

2. The most interesting collections of sylvan mosquitoes, which included many new forms, were taken by Col. E. R. Whitmore, M. C., at Camp Stotsenberg. Colonel Whitmore took collecting tubes, killer, and vials, and went about 2 p.m. into the jungle near the camp, staying for two or three hours and sitting so quietly that "the wild hens paid no attention" to him, allowed the mosquitoes to settle and bite, and so secured rare specimens, some of which have never been duplicated. And this was in 1904! The very few disease bearers among them were marked "Caught in the woods, hospital and quarters," and it is to be remembered that Colonel Whitmore's collecting stations were not far from the camp.

3. I myself have in the Philippines often taken many Anophelines about 5 a.m., when the early morning sun was sending level rays into the houses, and these mosquitoes were eagerly seeking the way out. In fact no collections I ever made compared with these for the number of Anophelines. This does not, however, mean that this is the only part of the daylight in which Anophelines may be taken. There have been too many excellent collections taken during midday to allow of such a

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statement, and the experience in some parts of Panama, where control of adults can only be effected by "hand catching," would entirely disprove it.

I also found daylight collections, taken during the hours of the "siesta" in the partly darkened rooms, gave excellent results in securing *Stegomyia fasciata* and other house-infesting culicines.

The first response to Colonel Howard's letter was quite general. During the summer collections have been received from fifty-seven stations, but while the records from some stations show the collections to have been regular and without intermission, unfortunately they are much in the minority. From one-third of the posts only one collection was received, and that in spite of various reminders, while from three no collections at all have come, and in one instance came the naive excuse that *after August 20* efforts had been made to secure specimens but none had been obtained, and this in response to directions issued in March! At any one of these three stations, the chances of there being no Anophelines during the season, still less of there being no mosquitoes during that time, are extremely small.

Part of the failure to send continuous collections was due to the fact that when the divisions were ordered to new stations the papers and records were taken with them, and the officers who succeeded in command of the posts were often entirely uninformed in the matter. This condition was not at once recognized at the Surgeon General's office, and there was some delay in sending duplicate instructions.

Only a general idea of the results can be given, but the records from the collections are interesting and may prove instructive.

From Camp Lewis, American Lake, Washington, were sent very brilliantly marked *Anopheles punctipennis*, and from Camp Custer, Battle Creek, Mich., came *Anopheles quadrimaculatus*, *Anopheles punctipennis* and *Anopheles walkeri*, but neither of these posts has record of any but "recurrent" cases of malaria. Further south some of the stations showed as many as four species of Anophelines, and three of them malaria carriers! It is needless to say malaria was present.

The distribution of the Anophelines is also of some interest. Of these *Anopheles punctipennis* is, so far as these collections go, much the most widespread of all, being taken in Washington, Michigan, the western, the southwestern, the southern-border, the Gulf, the middle-western and the Atlantic states so far north as collections have been made in connection with this work. It occurs in connection with each of the other Anophelines as well as alone.

Anopheles quadrimaculatus, A. barberi, and A. atropos are all taken in the Atlantic coast states, the first spreading over into other sections

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rather generally, but apparently not so widespread as *punctipennis*, and, either because it is present in less numbers or because it is more shy and less easily taken, is not sent in so frequently or in such large numbers as *punctipennis*. The other two species have definitely restricted localities, but *atropos* has been taken in Louisiana and is not well known.

Anopheles pseudopunctipennis is confined to a comparatively small region in the southwest, apparently not east of Texas nor north of San Francisco, but extends southward and is taken in large numbers in Panama.

Anopheles crucians shows a rather definite choice of localities, extending from the general vicinity of Washington and a little further north in the late summer, down the Atlantic coast states (on the general coastal plain), in the Gulf states as far as Louisiana, and probably eastern Texas, and up the Mississippi River as far, at least, as Little Rock, Ark. The localities suggest some peculiar choice of breeding places, not yet sufficiently worked out to admit of definite statement, though Dr. Metz's[2] article "*Anopheles crucians*, Habits of Larvae and Adults," gives very interesting points which apparently lead along this line.

The highest record of Anophelines at any one post in any one collection was eighty-four *Anopheles punctipennis* and sixteen *A. quadrimaculatus;* here, also, malaria was present. The next highest records are of thirty-four *Anopheles* in one collection, both of these being in camps in the United States. These records are, however, not to be considered as in any way reflecting on the sanitary officers at these places, because it is not always possible, even with the most careful and intelligent work, to control the breeding places in the camps, and our present knowledge precludes, as unwise, the assumption of a definite limit of flight from the extra-cantonment areas, which cannot perhaps be controlled.

The first specimen of *Stegomyia fasciata* from these camps was from Chattanooga, and it was rather quickly followed by specimens from Austin, San Antonio, Montgomery, Carlstrom Field, Florida, and Camp J. E. Johnston, Florida, the largest number coming from Camp Travis, San Antonio.

The routine methods at the Army Medical Museum have been, and are, the examination and determination of specimens and the recording of each lot under its proper post. The records cover all points available: date and hour of collection, name and number of each species, the report as to insect-borne diseases present, and the average strength

[2] Metz, C. W., Ph.D., Special Investigator, P. H. Report, Vol. 33, No. 49, December 6, 1918. Read at the annual meeting of the American Society of Tropical Medicine, June 16-17, 1919, Atlantic City, N. J. Published by permission of the Surgeon General, U. S. Army.

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of the command, each being entered in successive columns on the same page, so that the whole story may be read at a glance and be quickly available for reference. A report of the findings of the collection is then sent to the camp surgeon and a memorandum sent to Colonel Howard showing the posts, dates, and in what numbers disease-bearing mosquitoes were taken. This method keeps the camp surgeons informed as to the kind of collections sent in and the Division of Sanitation of the whereabouts of the disease-bearing forms.

The lack of uniformity in the collecting has, of course, affected seriously the records, but, while not so complete as had been hoped for, it is believed they will prove of some value not merely for the Medical Corps of the Army, but, in connection with the work by the Public Health Service, will serve in that general survey of our country when, for the health of the whole people, the extermination of malaria is taken up as thoroughly as the hook-worm has been, and, while the work was done by and specifically for the Army, this thought has been always in mind.

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DETECTION OF CARRIERS AND MISSED CASES OF DIPHTHERIA IN EMBARKATION AND DEBARKATION OF TROOPS

By Major EDWIN HENRY SCHORER, M. C., *Director of the Laboratory Division,* and AGNES SCHOLL RUDDOCK, *Contract Surgeon, Director Technical Work, U. S. A. Laboratory, Port of Embarkation, Hoboken, N. J.*

THE diphtheria bacillus is one of the most definitely recognized micro-organisms; man can be tested to determine whether he is susceptible to its action sufficiently to develop the clinical disease known as diphtheria, and a specific antitoxin has been produced for the successful treatment of the disease. For these reasons the world at large and the medical profession especially are little inclined to pardon the spread of diphtheria bacillus infections, the occurrence of clinical diphtheria, and deaths due to this disease. Diphtheria has been so prevalent in this war that it must definitely be considered an army disease.

Unfortunately the diphtheria bacillus began to play an important part soon after the mobilization of the Army in 1917, and clinical cases of diphtheria and deaths due to the disease have occurred from time to time. Many times the disease was not recognized until at the autopsy table; this occurred not only in our cantonments in the United States but also among the fighting troops and troops in the reserve in Europe. Information is at hand that, not infrequently, gas poisoning was diagnosed when diphtheria actually existed. It was generally relatively easy to eliminate the disease from the organizations in the cantonments by taking nose and throat cultures of contacts and whole companies, so that while, not infrequently, diphtheria patients were received from these organizations and carriers were detected and held in quarantine or the hospital until free from diphtheria bacilli, the problem in the organizations in the field was not a serious one. In our hospitals, likewise, the spread of the disease was easily controlled by detecting and taking out the cases and carriers.

It was when soldiers were put under conditions where the space was limited or the field of their daily activities was restricted, even though not to the extent generally known as overcrowding, that infection with the diphtheria bacillus became an important factor. Trains and ships for the transportation of troops and hospitals for the care of the sick were the centers of the disease and needed to be most closely watched. The problem, therefore, was of utmost importance in this port of embarkation, through which alone 1,833,000 troops were sent overseas.

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It is not proposed to enter into the clinical diagnosis or treatment of this disease, nor do we want to theorize on the manner of spreading the infection or overcrowding of space, nor do we feel certain as to the problem of contagion in general. We want, however, to emphasize that in the twenty-four hours to five days that were needed to bring troops to the port of embarkation, the clinical disease diphtheria not infrequently appeared apparently from a clear sky, that sick and wounded returning from overseas frequently had the disease or were carriers, and that the diphtheria bacillus really constantly presented a problem in embarkation and debarkation of troops. It cannot be assumed that infection with the bacillus and the development of the clinical condition all occurred while en route to this port of embarkation. The infection must have existed before the start was made, and while on the journey the host must have become sufficiently susceptible to make the development of the clinical condition possible. It has been observed that, not infrequently, apparently well carriers get the clinical condition when confined within doors, even if there is no overcrowding. Within one month after the base hospital at Camp Merritt was opened—that is, early in February, 1918—diphtheria bacilli, both in clinical cases and carriers, were found in practically every ward. The infection was so widespread that all of the patients in the hospital and enlisted men nurses and officers on duty in the hospital were cultured and the carriers isolated. After this all patients admitted to this hospital had throat cultures taken in the receiving office, and all patients remained in observation isolation wards until the cultures could be examined and reported on. From that time diphtheria has never been a general hospital menace at the base hospital, Camp Merritt.

With the opening of the base hospital at Camp Mills the same routine was established; later it was discontinued but resumed very soon, for the disease became a hospital menace when the precaution was not taken. When sick and wounded were brought back from overseas and our hospitals began to function for debarkation, the importance of diphtheria became at once evident, and on December 7, 1918, the following letter was sent by the surgeon:

OFFICE OF THE SURGEON, PORT OF EMBARKATION
HOBOKEN, N. J.

December 7, 1918.

From: The Surgeon.
To: All Commanding Officers of Hospitals.
Subject: Diphtheria in hospital patients returning from overseas.

In the patients returning from overseas there have been a number of cases of diphtheria and in one debarkation hospital there now are some fifty cases of diphtheria and diphtheria carriers.

Since March all patients admitted to the base hospital at Camp Merritt and

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for some months all patients admitted to the base hospital at Camp Mills have had throat cultures taken by the receiving surgeon at the time of admission to the hospitals. At both of these hospitals patients have been held in receiving or observation wards until the laboratory reports on the throat cultures are made. This holds patients in the observation wards from twelve to twenty-four hours at the most. Patients having diphtheria bacilli in the throat and nose are put in special wards, those having clinical diphtheria are treated accordingly, while those who are merely carriers are Shick tested, sprays or instillations of 4 per cent argyrol or 1 per cent silver nitrate made in the nose several times a day, a gargle is provided, and at two-day intervals throat cultures are taken until three consecutive negative cultures obtained.

It has been found that most of the carriers quickly clear up when removed from the actual clinical cases, and that the chronic carriers are chronic carriers because of tonsil or adenoid abnormalities which can be operated on and corrected.

It has been found that culturing on admission and taking out the carriers helps markedly in the movement of patients through the hospital.

It is proposed that the Director of the Laboratory Division of this office notify the chief of the Laboratory Service of your hospital when patients from overseas are expected, that the chief of your Laboratory Service will supply the personnel to take cultures from the throat and furnish you a report as soon as possible. It is realized that this will give the laboratory a considerable amount of work at one time but, generally, will not give more than two heavy days in each week. The Laboratory of the Port of Embarkation will help supply such materials and examine such number of cultures as cannot be taken care of in your laboratory. The treatment and care of carriers as is outlined earlier in the letter is suggested.

By direction of the Surgeon:

EDWIN HENRY SCHORER,
Major, M. C., U. S. Army.

Since December 10, 1918, no patient has been admitted to our hospitals or transferred from hospital to hospital in these headquarters but what a throat culture has been taken for the presence of diphtheria bacilli. We have used the following classification:

1. Clinical cases.

2. Carriers. The carriers may have become such because of infection from (*a*) clinical cases, or (*b*) carriers.

The carriers may be casual or chronic. We have generally listed as a casual carrier a soldier whose throat became diphtheria-bacillus-free within ten days after isolation, three negative cultures on alternate days being necessary to release the carrier.

The plan for taking and examining cultures generally used at the United States Army Laboratory, Port of Embarkation, is as follows:

The laboratory was informed of the number of patients to be expected on each ship and materials were prepared in readiness for the notification from the receiving office of the arrival of the patients. After medical examination, delousing and bathing, all patients passed through a small door near the elevators which were to take the soldiers to their assigned wards. At this door was placed a table of supplies,

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with a team of three laboratory workers, one to take the throat cultures, one to record the names and wards, and one to number each tube after inoculation with the same number which appeared before the soldier's name on the written sheet. The record of the names was kept on ruled sheets as follows:

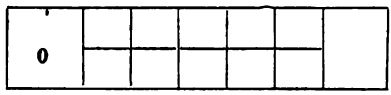
U. S. S. *Agamemnon*, Feb. 3, 1919

No.	Name	Ward	Floor
1	Barefield, Willie	2	5
2	Gordon, Herbert	3	3
3	Carrigaro, Daniel	3	3
4	Hall, Frank	2	5
5	Hurd, Percy	2	5
6	Senis, Robert	9	3

The culture of Willie Barefield was numbered No. 1 with a red wax pencil; that of Herbert Gordon was numbered No. 2, etc.

After each man was cultured he proceeded to his ward. If there were any litter cases arriving at the same time as the ambulatory patients, another group was stationed at the elevator which took the litter patients upstairs. Sometimes, if there were a thousand or more new admissions, two tables and two sets of workers were placed at the door to facilitate the clearing of patients from the receiving room. In that case the group at Table I kept the names in books (previously numbered 1–100, 300–400, 500–600), while Table II used the alternate sets of numbers and marked their tubes accordingly. With such an absolute system the men could be cultured quite rapidly; the work on an average day was timed, and we found that 1,206 patients were cultured by two groups at the approximate rate of 200 per hour. This, of course, depended upon the speed with which the men entered and passed through the receiving rooms.

The cultures were placed in the incubator and left there from eight to twelve hours. Upon removal from the incubator the tubes (which could not have been kept in exact order) were renumbered with a blue pencil beside the red number starting at 1 and set apart in consecutive groups of ten. With each group was a glass slide marked off into 10 squares:



The number at the left of the slide was the index number; slide No. 0 having consecutive smears of tubes 1–10 (blue pencil), slide No. 1

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tubes 11–20, slide No. 20 tubes 201–210, etc. On a ruled sheet was recorded the old (red) number of each tube as well as the new number: when the fifth smear on slide No. 0 was found to be positive, No. 5 on this list showed that the tube was No. 610, which number and the corresponding name were easily located on the original list. After smears were made on the ruled slides, the tubes were discarded and the numbered lists were relied upon for the location of carriers. A great deal of bookkeeping and labor was saved by recording and reporting the positive cultures only; if no report was received in a ward at the end of 24 hours the surgeon knew that there were no carriers among the new patients.

New No.	Old No.	New No.	Old No.	New No.	Old No.	New No.	Old No.
1	603	9	273	51	547	59	52
2	12	10	815	52	416	60	68
3	57	11	360	53	62		
4	906	12	289	54	78		
5	610	13	74	55	110		
6	48	14	32	56	36		
7	3	15	97	57	427		
8	94			58	319		

The diagnosis of the diphtheria bacillus has been entirely based on the morphology of stained specimens under the microscope. The routine stain was Neisser's methylene blue (30 sec.) and counterstain of 0.5 per cent aqueous saffranin (15 sec.). This gave a distinct marking of bright blue granules in a pink bacillus. Positive diagnosis was made only when the bacilli showed polar granules, or distinctly barred and uneven staining. It is interesting to note that Captain Blanton in his "Report of Diphtheria at Camp Custer, Michigan,[1] found that 90 per cent of organisms isolated from *clinical* cases showed di-polar granules. The virulence of the organisms was not tested in this laboratory, nor was it deemed necessary to do so. The cultures were obtained from soldiers whose companions had true clinical symptoms and who themselves developed the clinical symptoms. We did test a considerable number of isolations on the various sugars, and none gave the characteristic reaction of the pseudo-diphtheria bacilli.

The efficiency of our methods, that large numbers of cultures can be well taken and examined, and that the movement of patients through the hospitals need not be interfered with, was easily proven. A few instances only need be given. On January 12, 1919, two soldiers, whose cultures had been found to contain diphtheria bacilli, were absent without leave, and on March 20, when the same organization was again cultured, these same two soldiers were again found to be carriers. On March 12, two men in an organization were found to be carriers, but by error were not removed from the organization by the 23d of March when, on culturing the organization, the same two soldiers were again picked up. Two clinical cases were released on recovery after three negative cultures. One week later all the patients in the ward to which they had been transferred were cultured and no carriers were detected.

[1] Blanton, W. B.: Report of Diphtheria at Camp Custer, Michigan. Torr, A. M. A., May 10, 1919, p. 1355.

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In not all of the hospitals was it possible to distinguish between soldiers just off the transports and patients already in our hospitals. However, at the large hospitals used for debarkation, Debarkation Hospitals Nos. 2, 3 and 5, and Embarkation Hospital No. 4, we have data on 50,456 admissions of patients directly from overseas.

The results of examinations are shown in Table I.

TABLE I.—*Showing Cultures for Diphtheria Bacilli in Soldiers Arriving on Transports.*

Month	Debarkation No. 3			Debarkation No. 5			Debarkation No. 2			Embarkation No. 4		
	Patients	Pos.	Per cent	Patients	Pos.	Per cent	Patients	Pos.	Per cent	Patients	Pos.	Per cent
Dec.....	4,482	34	0.7	810	14	1.73	2,261	60	2.65	384	2	0.5
Jan.....	2,958	37	1.18	1,442	19	1.32	2,033	59	2.41	278	2	0.71
Feb.....	3,198	51	1.62	2,958	45	1.52	1,128	17	1.51	425	1	0.21
March...	5,651	70	1.23	5,473	61	1.11	1,106	5	0.45	294	1	0.34
April....	8,520	81	0.99	4,047	32	0.79	.....	.....	.....	438	1	0.23
May.....	2,378	19	0.79	.....	.....	.....	.....	.....	.....	229	1	0.4
Total..	27,187	292	1.07	14,730	171	1.15	6,530	149	2.13	2,012	8	0.39

Grand total: Patients 50,456; Positive, 640; per cent, 1.26.

From the table it will be seen that at the different hospitals the percentage of positive cultures varied from 0.39 to 2.13. It is, however, to be noted that Debarkation Hospital No. 2 served largely for contagious debarkation patients, Embarkation No. 4 for officer and nurse debarkation patients, while Debarkation Hospitals Nos. 3 and 5 were used for general enlisted men's debarkation hospitals. In December, 1918, and January, February and March, 1919, the percentage was higher than in April and May.

While 1.26 per cent of positive cultures in debarkation patients is not high, still the actual number, 640, is large when the short period of time and the actual number of exposures are considered and well justifies the labor expended.

Table II shows the relation between carriers and clinical cases at Debarkation Hospital No. 3. The clinical cases were practically always detected on admission cultures.

TABLE II.—*Showing Carriers and Clinical Cases Admitted to Debarkation Hospital No. 3.*

Month	Patients admitted	Carriers	Clinical cases
December, 1918.....	4,482	34	2
January, 1919.....	3,958	37	13
February, 1919.....	3,198	51	20
March, 1919.....	5,651	70	30
April, 1919.....	8,520	81	17
May 1–15.....	2,378	19	15

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From March to September 1, 1918, 10,079 embarkation patients were admitted to the base hospital at Camp Merritt. The findings are shown in Table III.

TABLE III.—*Showing Results of Cultures on Admission of Embarkation Patients to the Hospital*

Month	*Total number*	*Total positives*	*Per cent*
March	1,534	54	3.52
April	1,694	68	4.01
May	1,815	47	2.59
June	1,764	43	2.44
July	1,632	14	0.85
August	1,640	22	1.34
	10,079	248	2.36

It will be observed that the percentage of positive diphtheria cultures was larger for embarkation than debarkation patients.

It is evident that isolating, from the general patients, those harboring diphtheria bacilli, is feasible and indicated. The organisms in the throats of carriers and patients were readily transmitted to others and it was necessary to take cultures on our hospital personnel almost every month because cases occurred in the doctors, nurses and hospital corps men. In the hospital personnel the rate was very high. The rate is shown in Table IV.

TABLE IV.—*Showing Results of Cultures on Hospital Personnel*

Month	*Total*	*Positive*	*Per cent*
December, 1918	57	3	5.26
January, 1919	2,335	49	2.09
February	52	3	5.76
March	2,566	109	4.25
April	2,717	42	1.55
May	1,991	39	1.96
Total	10,118	245	3.38

From the table it is seen that the hospital personnel on duty at debarkation hospitals was very frequently infected, the rate being double that of debarkation patients. Probably the high rate in February and March was due to coexisting respiratory trouble in patients. During this same time ambulance drivers, crews on our receiving ships, hospital trains, guards and so on, who did not take care of patients, only had a carrier rate of 1.03 per cent in nearly 4,000 cultures taken.

The detection and taking out of carriers, in hospitals which must be quickly evacuated, might at first be regarded as a drawback so far as evacuation is concerned. Some believed it unnecessary, but this we believe we have already disproven; others doubted the virulence of the organisms, but this, too, we believe has been disproven by our data. Most of the carriers are not sick and clear up rapidly when properly treated.

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While carriers were usually treated at the hospital in which they were detected as carriers, an effort was made to collect them at certain hospitals as often as was possible. Usually argyrol or silver nitrate swabs and sprays were used once or twice a day, gargles of Dobell's solution were used three times a day, chronic carriers were taken care of by the nose and throat specialists, and not infrequently the tonsils were removed. While the treatment was practically the same everywhere, the results differed markedly. This is shown in Table V.

TABLE V.—*Showing Length of Time Patients Had to Remain in Isolation as Diphtheria Carriers at Various Hospitals.*

	Casual carriers				Chronic carriers						Grand average in days
	No. of carriers	Less than 10 days			10 to 20 days			20 days or longer			
		No.	Per cent	Aver. No. days	No.	Per cent	Aver. No. days	No.	Per cent	Aver. No. days	
O'Reilly.....	65	30	46.1	7.8	24	36.9	12.9	11	18.3	22.7	12.2
Deb. No. 1.....	100	42	42.0	6.8	35	35.0	13.7	23	2.3	28.7	10.94
Deb. No. 3.....	276	178	64.2	5.1	74	26.7	12.7	15	5.4	24.4	8.0
Deb. No. 5.....	36	32	88.8	7.0	3	8.5	15.3	1	2.3	22.0	8.1
Emb. No. 4.....	66	59	89.4	8.4	7	10.5	11.8	0	000	0	8.8

Embarkation Hospital No. 4 (Polyclinic Hospital, 50th Street and 9th Avenue, New York City), for officers and nurses.

Debarkation Hospital No. 1 (Ellis Island). Contagious disease hospital data include convalescents from clinical diphtheria.

Debarkation Hospital No. 3, Greenhut Building, New York City, general debarkation hospital.

Debarkation Hospital No. 5 (Grand Central Palace), general debarkation hospital.

Hospital Ship *O'Reilly*, tied at Pier 45, North River, New York.

It will be observed that in all hospitals there were some chronic carriers but that officers and nurses quickly cleared up, and that in the large hospitals a large percenage were only casual carriers. On the hospital ship a large percentage remained carriers a long time, and apparently getting out in the air and sunshine makes a great difference. This is well brought out by the results on the hospital ship *O'Reilly*, where only 12 per cent cleared up in ten days or less compared to the results at Embarkation Hospital No. 2 in the country at Secaucus, N. J., where out of 270 carriers only 9, or 0.033 per cent, had to be held for more than ten days to get three negative cultures.

SUMMARY

1. Diphtheria is a disease of considerable importance in an army quickly mobilized.

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2. Many soldiers in an organization develop clinical cases or become carriers in a short time.

3. Hospital attendants are easily and frequently infected in caring for the sick.

4. Taking throat cultures for detection of cases and carriers on admission to the hospitals is feasible, warranted and indicated.

5. Most of the carriers can be quickly cleared up when removed from the foci of infection.

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NOTES ON HOSPITAL TRAIN SERVICE IN THE A. E. F.

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PRIOR to the date when the United States became actively engaged in the late war, the question of equipment for wholesale evacuation by rail, under conditions of modern hospitalization, had been considered and so far worked out that the Pullman Company had constructed one specimen car of the sort. The Manual of the Medical Department touched generally upon the subject, and Field Service Regulations sketched the relation of the Hospital Train Service to the Military Railway Service. When hospital train personnel began training about January, 1918, the only source of information anent equipment was to be found in a reprint of a British account of a sixteen-car train, British built, and recently exhibited in London. As cited in this bulletin, the personnel was to consist of 3 medical officers, 3 nurses, and 31 enlisted men of the Medical Department. As organized in medical officers' training camps, train units were commanded by majors, M. C., assisted by two first lieutenants. Early in the year it was found necessary to divert the majors M. C., and the command and organization of hospital train units was committed to officers of the Reserve Corps. Under these officers hospital train units were equipped with equipment "C" as rapidly as the matériel was available, noncommissioned officers were instructed in their duties, and the enlisted men given the maximum daily amount of drill, hiking, and instruction in first aid, surgical nursing and sanitation that could be crowded into twenty-four hours and have the men thrive. The net result of this intensive training was that, at the date of embarkation, each commanding officer of a hospital train unit had under his command a small, compact unit of 31 men, well schooled in the manuals pertaining to their work, capable of executing commands with unquestioning intelligent precision, and requiring little disciplinary action upon the part of the commanding officer; a unit which was readily adaptable, because of the breadth of its fundamental training, to exercise the functions of sanitary organizations, and available for duty in the inspection and in the treatment of larger bodies of troops. Such hospital train units were frequently available and were used at ports of embarkation, on transports, at ports of debarkation and in rest camps in conducting the frequent physical examinations necessitated by the crowding of transports in the large troop movements of that period. On the transport they manned the sick bay and dispensary and throughout the voyage assisted at the frequent physical

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examinations which were made to exclude communicable disease. If it so happened that the commanding officer of a hospital train unit was at the same time surgeon to troops or S. M. O., then the train crew became at once his efficient fingers for the execution of transport sanitation and for the care of the sick.

There were in the service of the A. E. F. several efficient trains of the French type with corridor cars and litters on standee frames, but as these were in no sense standard equipment they will not be dealt with at this time. Of the standard United States hospital train there were some twenty or thirty in commission, and there would have been more up to the number of fifty had the war lasted longer and the need for them become apparent. Of this type of hospital train, U. S. Hospital Train No. 58 is a typical example. It was composed of sixteen cars built of wood upon steel frames, with central corridor the length of the train, solid vestibule, and with doors in the middle of the sides of each car, built in the shops of the London and Northwestern Railway, ferried across the Channel and delivered to the shops of the 19th Engineers at Nevers, Nievre, where it was assembled as a train and the installations completed, including the coupling up of the generators with the axles of the trucks on each car and the setting up of the storage batteries through which the generators worked. These generators and batteries were the source of our light, and after the charge acquired on the initial run to Brion-Laizy we were never without ample light for all purposes. Car 5801 was the isolation ward car and was divided by transverse partitions with sliding doors into four compartments of six beds each, with a central section into which the side doors gave entry and in which were situated two latrines and a wash sink with running water. This mid-car space could comfortably accommodate sitting patients up to the number of 10, in addition to the 24 bed patients which the car normally accommodated. Car 5802 was equipped with three rooms for officers and three rooms for nurses, with separate dining compartments for each at the opposite extremities of the car as well as a wash-room for nurses in their quarters. A swinging door in the lateral corridor separated nurses' quarters from officers' quarters. This car was equipped with independent heating apparatus.

Car 5803 was the kitchen which served officers and nurses and, on the run, served the forward end of the train. In this car was also the officers' wash-room and latrine, as well as two compartments for the transportation of 16 sitting sick or wounded officers. At its rear end was a bath and shower for officers. For reasons of water economy this shower was sealed early in the career of the train. Cars 5804-5-6-7-8 were ward cars of the standard type, the same double doors in the

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middle of each side of the car as was noted in the isolation ward car, which was a modification of the standard ward car, which had eighteen beds on each side of the car arranged in three tiers. These beds were made with iron frame and wire springs and a medium thickness fiber mattress, the whole easily demountable for cleaning and so arranged that the middle bed could be folded back against the side wall of the car, in this position forming the cushioned back of a bench of which the lower bed formed the seat. This arrangement of the beds made almost instantaneous the transformation from a ward designed to accommodate 36 lying patients to a ward which accommodated 12 lying upon the top tier of beds and seated 5 to the bench—60 sitting patients—thus doubling the capacity of the car without in any way encroaching upon the aisles or other free spaces. Each car had independent water tanks, with sink and running water, a cupboard with the ordinary ward utensils and a compartment in which was a bucket latrine as well as racks for bed pans and urinals.

Car 5809 combined office and pharmacy, having at one end a small ward of twelve beds, next a well-equipped pharmacy with water and instrument sterilizers operated by "primus stoves," next a comfortable office with small safe and ample accommodation for the keeping and storing of records and papers. Beyond this, in the same car, was a compartment designed for operating and dressing room, which was ample for an ordinary work of the sort. The operating table was formed by a medical department litter supported against the outer wall of the car by two swinging brackets. Immediately above the operating table was a second set of similar brackets, so that in emergency this compartment could be used with two litters as bunks, making a two-bunk compartment. Cars 5810-11-12-13 were of the standard ward type. Car 5814 was the kitchen serving the enlisted personnel and the rear half of the train and contained, as well as the personnel dining-room, a three-bed sleeping compartment for the noncommissioned officers. Car 5815 was a slight modification of the ward car and was fitted up with beds for the enlisted personnel, with a moderate space devoted to lockers and storage of personal effects. Car 5816 was the storage and equipment car and was supplied with ample and well-arranged cupboards, lockers, and shelves for the storage of supplies and spare parts for the train. There was in addition, at the rear end, a small office for the supply officer, in the rear of which was a meat safe cooled by the circulation of air. Ice was not available for issue, and therefore the storage of meat was a matter of some difficulty in warm weather. Meat supply was a very important consideration and called for much careful planning.

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At the extremes of the train, and not communicating with the rest of the train, were compartments for the railway employes. In these compartments were hand-basins with running water, water closet, and a cushioned bench of sufficient length to permit of reclining at length.

Such was the train found waiting at Nevers upon arrival of the hospital train units from the base ports. Upon assignment to a train by the chief surgeon of that district, requisition was at once made for such articles of equipment as were needed, for rations for the personnel, as well as 2,000 reserve rations required to be at all times on hand. An additional enlisted man was received here in the person of a mechanic from the 19th Engineers, who was attached for duty with the train and was charged with the maintenance of the mechanical equipment of the train, brakes, running gear, electric lights, etc.

All train movements were made upon "*Ordres de Transport*," which are in effect and in form not unlike our "Transportation Requests." Orders directing train movements came through the "Regulating Station" or "*Gare Regulatrice*." Such were located at Le Bourget, in the district of Paris, and at Is sur Tille and St. Dizier in the advanced sections of the S. O. S. Regulating stations were in possession of routing data and in constant touch with the French Railway Commission, and all matters concerning the railway service were arranged by them. The French system of railways, although well adapted to their needs, seems, to the mind habituated to our system, to be inelastic and hidebound by traditions which we have long since outgrown. However, their system enabled them to fight in the way that they did, and that in spite of the fact that they were very obviously crippled in the matter of man power as well as in the matter of equipment and trackage, which had suffered both because of the shortage of matériel and of labor The use of the air brake, while the rule, is by no means universal, and upon many occasions the commanding officer of a hospital train has spent uncomfortable hours while being hurried along by a small but powerful engine and without an air brake capable of functioning. Occasionally at such times a crew of two or three women would be put aboard to operate the hand brakes, but this was not invariably done. The sense of insecurity experienced was commensurate with the relief felt when we again secured an engine with air equipment.

During the months of June, July, August and September, Hospital Train 58 made the following evacuations:

26 June, from Coulommieres to Vichy	352
9 July, from Vaugirard, Paris, to Savenay	610
16 July, from Coulommieres to La Chapelle, Paris	542
18 July, from Ivry, Paris, to Vichy	583

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20 July,	from Ivry to Chateauroux	302
	Limoges	268
23 July,	from Crepy én Valois to La Chapelle	341
25 July,	from Vaugirard to Bordeaux	578
29 July,	from Coulommieres to La Chapelle	562
2 August,	from Coulommieres to Chateauroux	428
7 August,	from Chateau Thierry to Chaumont	512
16 August,	from Vaugirard to Nantes	560
21 August,	from Ivry to Royat, Puy de Dome	381
27 August,	from Chateau Thierry to La Chapelle	429
29 August,	from Villers Cotterets to La Chapelle	221
31 August,	from Coincy to La Chapelle	452
2 September,	from Villers Cotterets to La Chapelle	348
3 September,	from Ivry to Nantes	340
6 September,	from Chateau Thierry to La Chapelle	330
7 September,	from Chateau Thierry to La Chapelle	406
9 September,	from Coincy to La Chapelle	423
16 September,	from Chaumont to Montpont, Dordogne	386
22 September,	from Langres to Tours	375
26 September,	from Souilly to Bazoilles, Haute Marne	408
Total patients to this date		10,137

At evacuation points loading was habitually effected by the combined efforts of the bearers from the hospital being evacuated and the enlisted personnel of the train. Speed in loading was rarely a desideratum, as under the usual conditions at the loading point no difficulty was experienced in loading as rapidly as the ambulances could bring up the patients. Frequently German prisoners were requisitioned for bearers, a function which they filled very efficiently. I shall never forget the uncanny impression made by a guard on duty with a couple of squads of prisoners who were assisting the loading at Chateau Thierry upon one occasion. Armed with a rifle and bayonet and with face smeared with mercurial ointment, he was a sight to strike terror to the most hardened. When fully loaded with all beds occupied, the capacity of the train was 360. When carrying both seated and lying patients, the load could be increased to 570 without making inroad upon the normally free spaces aboard the train. By placing lying patients in the personnel car and by placing extra seated patients upon benches in the middle part of each car opposite the side doors, the capacity of the train could be stretched to acommodate 610 without serious overcrowding. As a breakdown capacity, with 6 extra lying patients to the car upon litters in the aisles and all free spaces full, including the pharmacy floor and that of the operating room, the capacity could be stretched to the extreme limit, 740. In this instance the aisles were encumbered to a degree which made passing through the train slow,

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and the service to patients was slowed down in consequence. It will be seen that this is a very wide range of adaptability, and when it is remembered that the figure 610 represents no overcrowding of a train built to convey 360 lying patients, it will be conceded that the designers of this type of hospital car have achieved more than a moderate degree of success. The figures for the evacuations above cited are very illustrative in this connection, for on the night of the second of September, while shifting position in the yards at Pantin, the train was rammed by a freight train and cars 5811 and 5812 wrecked. From that date through the period covered by these notes the train was composed of fourteen cars only, with a bed capacity of 288.

When the order for an evacuation was received at the train and while en route to the evacuating point, both kitchens were placed in full swing, so that upon arrival, or as soon thereafter as a car was loaded and the doors closed, the ward master and his assistant could begin to dispense, to those in condition to receive it, the soup prepared in the kitchens. This soup, made from a fresh beef stock, with such vegetables as the local markets afforded, was the staple article of diet en route. After much experimentation it was found that, for the type of patient chiefly carried, this was at one and the same time the most acceptable to the patients and the most easily prepared in the quantities required. When fed and other personal wants attended to, patients were so tagged as to indicate at a glance the nature of the treatment that was required en route, fracture cases were vised and adjusted to secure easy riding, Dakin-Carrel cases were conspicuously marked, and the treatment carried out by instillation every two hours. Data for the "Detraining State" was collected from the tags and sent to the office for consolidation. In the first instance, dressings which required attention were done by a medical officer. Subsequent dressings were done by a medical officer or by an enlisted man according to his directions. In the earlier evacuations all Dakin-Carrel cases were treated by a medical officer, but soon, under their instruction, the enlisted men became habituated to the proper manner of carrying out the treatment, and to appreciate the evidences of its proper and of its improper execution and they were charged, under direction, with its administration, thus liberating several hours daily on the run to other details of treatment. It is believed that the importance of the Dakin-Carrel treatment cannot well be overstated, at least as regards the adminisration of it to wounded men in process of transportation by rail under these conditions. With the continuous application of this treatment, badly infected patients can be transported for as long as thirty-six hours and arrive at the detraining point in better condition than that in which they were en-

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trained. To those familiar with this neo-listerian antisepsis it need not be said that the continuance of the treatment en route hastens the date when secondary closure can be instituted, and thus saves, in the aggregate, hundreds of days of hospitalization. It was frequently remarked by visiting medical officers that, in spite of the large numbers of very gravely infected patients carried upon some of these evacuations, there was a complete absence of the "smell of pus" in and about the wards which had just been emptied. In this observation the officers of the train heartily concurred. In this connection it is to be remarked that the type of bed adopted for the hospital trains was one well designed for the handling of severe multiple fractures, for spinal cases, and for other severe mutilations, in that it was a very simple and easy matter to demount the bed, send it to the hospital and there have the patient transferred to the train bed and have bed with patient transferred to the train either by ambulance or, if the distance were not too great, by four bearers. When the bed with patient arrived at the train it was hooked into position in the most convenient location in the car, with reference to the probable need for access to the patient en route. At the detraining point, in like manner, the bed could be sent to the hospital, thereby minimizing the disturbance to the injured parts. This procedure was not infrequently resorted to.

For some time it was customary to operate the hospital trains with a male personnel only. This, in the writer's experience, was found to be entirely practicable from the standpoint of care and treatment of the patients, for the enlisted men were quick to learn and had a generally high appreciation of their responsibilities. They acquired great dexterity in the handling of patients, and, as they were under continuous bedside instruction, their possibilities were in no sense exhausted by the demands made upon them. Later the three nurses allowed by the Tables of Organization were supplied and, while they were in all instances very efficient as well as supplying interest to the sick and wounded in the presence of the feminine touch, yet probably in no material respect was the service rendered to the patients improved by their presence. Unavoidable inconveniences undoubtedly arose from the confinement of the two sexes in the contracted space.

Night evacuations from the advanced rail heads were often made under conditions of poor lighting and threatened bombing; aside from this they presented few features different from other evacuations, as the routine of loading at evacuation points was fairly well crystallized. When cars were loaded, the outer doors locked, and the word given to the *Chef du Train* that we were ready to leave, feeding, dressing and medication continued like clockwork throughout the run, one medical

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officer being at all times on duty in the wards and another supervising the kitchens and diets. On the run no one removed clothing, and if an officer or a man were relieved for a few hours he slept in full clothing.

The progress of the train was furnished to the detraining point in two ways; one, by a telegram sent by the commanding officer of the train either from the point of departure or upon the first opportunity, stating in both French and English the number of the train, number of bed patients, number of sitting patients, gravely injured, gassed, medical, communicable disease, French or other allies, German prisoners, and probable hour of arrival. The other information went through the *Gare Regulatrice* and the French Railway Commission and was a railway communication pure and simple, giving merely the number of the train delays en route and the probable hour of arrival. Arrived at the detraining point, there were turned over to the evacuating officer, by the commanding officer of the train, the "Detraining State," a tabulated statement of the classes of patients in the convoy, the valuables of the patients, for which receipt was taken. The cars were emptied in accordance with the directions of the evacuating officer.

Three hours after arrival usually saw the train empty and the *Ordre de Transport* for the return to garage signed and in the hands of the *Chef de Gare*. On the return trip the men usually slept in the wards the first night so that they could keep their eyes upon the property in the car, for stops on return trips, *petite vitesse*, were long and there were many occasions when, lacking this precaution, blankets and such like might have been checked short. Reveille the next morning was late, 8 a. m., and after breakfast cars were cleaned, washed down, blankets were folded for the laundry, and by 11 a. m. the cleaning was completed. In the afternoon fresh blankets were drawn from the supply car and the cars made up for another evacuation. This matter of the regular washing of the soiled blankets after each evacuation was an important one and is probably responsible for the small amount of infestation among members of the train personnel. The blankets were usually found to be highly infested. By 4 p. m. the work was completed and the wards stood inspection. Supper was at 5 p. m., and shortly after that the men were in their bunks. Some time in the early morning of the following day the train arrived in garage, when the mess officer at once began to restock the supply car, while the crew replenished the water tanks throughout the train. Early bed was the rule on this night also.

Water supply was at all times a problem of importance. Each car had two 100-gallon tanks connected with the wash sinks, and the two kitchen cars had extra tank capacity, but potable water supplies were

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not to be found in all parts, and the drain occasioned by a day's run with a full load of 500 or more was a matter which called for very careful water management. For this reason, when the train was switched into the "zone" at Pantin to charge the tanks from the hose connections there, as soon as the tanks were filled the G. I. cans, originally designed as receptacles for soiled dressings, but never used for that purpose, were filled with potable water and placed where they could be reached and yet be out of the way, and, as the kitchen tanks became low and before they were depleted to a point which would render it unsafe to use the kitchen ranges, these sources were drawn upon by the kitchen details. When in garage, out of the "zone" at Pantin the tanks were replenished every morning, but as the train was between one-half and three-quarters of a mile from the nearest hose connection, it was necessary for the water detail to fill G. I. cans, run them down to the train on a hand car, and fill the tanks with bucket and funnel. When garaged at Bourmont, Haute Marne, waiting for evacuations for the St. Mihiel Sector, the only source of water was a small spout distant from the train a third of a mile. This spout delivered the pitiful amount of half a gallon per minute, and in order to make good the daily consumption in the kitchen it was necessary to start the water detail early in the morning, continue all day and well into the night. In operating from this garage it was impossible to provide water necessary to cook for a loaded train and this, upon one occasion, led to a very considerable and uncomfortable delay in feeding a convoy evacuated from Langres, where the water was absolutely taboo, a fact unknown to the regulating station which directed us to charge tanks while loading with patients. The following incidents are worthy of recital as illustrating the ability and adaptability of the enlisted men of the Hospital Train Service. In the first case there were some 375 patients of all classes loaded in the early morning and, for the reason cited, the start from Langres was made with water sufficient only for a few hours' cooking. After a considerable controversy en route and a delay of five hours a water stop was arranged at Bar sur Aube, where there is excellent water in ample quantity distributed from some fifteen faucets beside the railway siding, but without hose connections. In the face of this mild emergency, with the customary bucket and funnel, the tanks were filled in forty minutes and the train proceeded to Tours, where it discharged its convoy at St. Pierre de Corps the following morning. The second incident occurred at the time of the collision at Pantin which wrecked two ward cars as we were preparing to make an evacuation from Coincy. Setting to work immediately after the accident the two wrecked cars were completely stripped of all movable property

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and fixtures; these were stored away on the train and all was in readiness to proceed with the evacuation upon schedule time. The men were justly proud of both of these achievements.

In all work over French railway lines there are many places and occasions where a moderate speaking knowledge of the language is important and of great service, not only in minimizing the unavoidable friction incidental to doing important and urgent work in foreign surroundings but in securing positive and sympathetic assistance from railway people of all grades.

Taken all in all, the hospital train service was an exceedingly useful and busy service. It offered large opportunity from the human standpoint and from the standpoint of surgical treatment, as differentiated from operative surgery, and in quiet times and out of the way places offered a rare opportunity to minister to the medical needs of a large civil population deprived by the war of all assistance of this sort.

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EDITORIAL

THE ANNUAL MEETING

Mention has been made in previous issues of the journal of the coming annual meeting. As has been stated, this will occur in St. Louis, Missouri, beginning Monday, October 13, with the last session on Wednesday, October 15.

As this meeting, the first since the close of the great war, will largely determine the future of our Association for better or worse, and as it will surely not be better unless we all get together at this meeting and do the things that should be done, it should be not only a pleasure but a patriotic duty for every member who possibly can to not only come himself, but to try and bring a prospective fellow. We should all help to make this meeting a post-bellum medico-military jubilee which will have as an end result the bringing together, as a unified body, all the medical patriots who heeded the call to the colors, to the preservation of the state, the perpetuation of our institutions, and the glory of American medicine.

The Headquarters of the Association in St. Louis will be at the Hotel Statler, corner of Washington, St. Charles and Ninth Streets. The assembly room of the meetings will be the Ball Room on the top floor of this hotel so that those who secure accommodations at the Statler will be in most convenient touch with the various sessions of the Association.

As a matter of interest to the members of the Association, we quote below the room rate schedule as given in the booklet of the Hotel Statler:

Room with shower bath only for one person, $2.00 per day; for two persons, $3.00.

Room with tub and shower for one person, $3.00 to $5.00; for two persons, $4.50 to $7.00.

Two connecting rooms for two persons, $6.00 to $9.00; for four persons, $9.00 to $13.00.

Suites of parlor, bedroom and bath (tub and shower), $6.00, $9.00 and $13.00.

Private dining room and additional bedrooms (connecting) may be secured if desired.

We also quote below the following paragraph from a letter of the Management to Col. F. A. Winter, chairman of the Committee on Arrangements:

We are just as glad to care for fifty persons as we are for five hundred, and our rooms at $2.00 per day are as cheerfully at your disposal as those of a higher rate.

We have expressed the hope in previous issues that this would be a

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well-attended meeting and, with the wealth of experience due to the war service of the members, there is every reason to hope that the program will be unusually interesting and instructive. It is the endeavor to have addresses and papers from the more prominent members of our Association and from those who are particularly qualified to speak on the subjects they have chosen. In order to give a working idea of the character of the meeting and the sequence of the various sessions, we publish herewith a tentative program covering the time from the opening meeting on Monday, the 13th, up to the final session. It must not be understood that this is final or authoritative in all minor details, as it is given mainly as a guide and indication of what the general purpose and scope of the meeting is to be:

ANNUAL MEETING, ST. LOUIS, MO.

MONDAY, OCTOBER 13

Opening meeting at 9.30 a. m.

1. Address of the President, Reports of Executive Council, Secretary-Editor, Treasurer, Committee on Arrangements, Literary Committee, Committee on Legislation, Boards of Award, Necrology Committee, Appointment of Nominating Committee and Committee on Resolutions, Consideration of Amendments to Constitution and By-laws, Miscellaneous Business.
2. Reading of two papers and discussion.

Second Session, 2.00 *p. m.*

1. Reading of two papers and discussion.

Third Session, 8.30 *p. m.*

1. Motion Pictures showing activities of the Medical Department in France, or topics of kindred interest.
2. Address or reading of one paper.

TUESDAY, OCTOBER 14

Fourth Session, 9.30 *a. m.*

1. Report of Nominating Committee.
2. Election of Officers.
3. Reading of two papers and discussion.

Fifth Session, 2.00 *p. m.*

1. Reading of two papers and discussion.

Sixth Session, 8.30 *p. m.*

1. Reading of two papers and discussion.

WEDNESDAY, OCTOBER 15

Seventh Session, 9.30 *a. m.*

1. Installation of Officers.
2. Report of Auditing Committee, Committee on Resolutions, etc.
3. Unfinished business.

It is earnestly desired that all those who can possibly do so will attend the meeting and lend their assistance in making it of unusual interest and value to the Association. J. R. C.

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WHAT WE HAVE BROUGHT HOME

The rapid change in events, the upsetting of our orderly and settled routine and regime which has come about since, on the 6th April, 1917, we declared that we were in a state of war with Germany, has of very necessity shaken about our ears much of the structure which before that time was all that we knew of existence. Now that we can see the promise on the other side of the clouds of war, I suppose that, individually and collectively, we are asking ourselves, "What did I get out of it?" Not in the sense of material gain, for, after all, comfortable as are physical blessings, we sought in our crisis other ends and made for a very different goal. Reflection must sweep a wide field to answer even in a general way, this question. When the Powers which direct our destinies at the Peace Conference have correlated each piece of the puzzle and shaped the whole into a harmonious entity, we shall be able to see what it means for us as a nation, as a people.

We are not political economists, we of the profession of medicine, and therefore our place in the part of our country's councils is at best limited to an intelligent effort to understand the logic which frames the terms, and to agree or disagree with the findings in the spirit of moderation which is becoming in those who must perforce judge largely in ignorance.

From that angle, then, we must have no active concern as to what our efforts have enabled us to bring home. It is to be settled for us by heads wiser than ours.

If we leave the questions of international politics as too broad a matter for our speculation, we still find ample opportunity for analysis of matters which affect us as a profession and as individuals. It is not probable that we shall now find for ourselves, either as medical officers, or doctors, or as the ultimate *ego* of the individual, altogether satisfactory responses to all the things we ask. This is not unnatural.

In the first place, the events of which we have been a part were of such magnitude that the grasping of them and the orderly classification of them are something which cannot be done by "snap judgment." Then, again, we believe very firmly in the French dictum, "*le nuit porte conseil.*" Time does modify views which at first seemed beyond dispute. Logic loses its verity when it has stood over night and has had a chance to cool. "Colors seen by candle-light do not look the same by day." And so, we believe, the convictions which many of us hold at present may undergo modification as we view them from the perspective of "tomorrow," where often the light is better than in the haze of "today." This is, in our opinion, true of some things; not so of others. When it is a question which depends for its answer on the

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personal equation of the individual, it must be granted that reflection, possibly a loss of a certain amount of prejudice, will turn the ashes of utter disapproval to a somewhat brighter tint and that we may see that the thing was not, after all, utterly bad. But, on the other hand, there are questions of fact. Modes of procedure which universal trial has proved at fault. New processes which have stood the acid test of actual use, which do not depend on the workings of our minds for their evident and manifest usefulness.

We suppose that the things in this category are those which are often referred to as "the lessons of the war."

Those, tried and found good, are surely some of the things which we have brought home. And we are sure that none of us will fail to admit that they are worth keeping and worth using again in the life to which we revert, whether it be in prevision against future conflict or in the accustomed routine which we knew before the Four Horsemen of the Apocalypse swept over our land.

It seems to us—has always seemed—that the lessons of this sort have a very general application—are not to be confined to any one particular class. Surely the advances made in the many steps of the technique of our chosen profession must be a matter of common interest to each of us, whether we remain with the profession in arms or go back to the ways of peace.

We do not intend to categorically list here the things which we have brought home. Our object in the title of this editorial is to suggest to other individuals the same thing which has been running throug hour mind. Did you profit by the opportunity which knocked at your door? If you did, in what way? If not—then whose was the fault?

It occurs to us that some of the things which we might have brought home were a keener knowledge of ourselves, our capabilities and our limitations. A better knowledge of our fellow-men. Admiration for those who held their heads up and played the game. Regret for those who failed in the hour of trial. Memories of cheerful courage, of patient resourcefulness, of fortitude, of skill and well-applied energy; of smiling, willing acceptance of the hard luck which held some while others went; of the spirit of sacrifice which animated us, the people of the Republic, to give of our best as long as we could, wherever the fortune of war set us. All this must have worked to broaden us and to broaden our views, and, in a profession which has such paramount need for qualities of this kind to live up to its traditions, we must have profited by what we saw and were a part of.

We viewed life from a large angle. We departed from the view of

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the retailer to know how big things could be done in a big way, and that should help us too.

Better perhaps than all else, *we came to know each other.* To have done that, and to have found that, after all, there is so much more to praise than blame in the world is a lesson very worth while.

Suffering, pain, agony, privation—all that we saw too. Many times, for, alas, that is war. But, after all, it was not just the torn flesh, the racked nerves, the acute physical misery—it was the Spirit behind it. The fine soul which, unconquerable in its extremity, counted as little its own torment provided only that the Right should not perish.

F. R. C.

REDIVIVUS

Senate Bill No. 1258 proposes that it shall be a misdemeanor, punishable by fine or imprisonment, or both, to use any dog in the District of Columbia or any of the territories of the United States for experimental purposes. It is directed, of course, against experimental medicine and is a continuation of the fitfully flaring fight against "vivisection." The phrasing of the Act is mostly for the dog instead of against the vivisector. Save by the implication in the context, it is more of a plea for the dog than an arraignment of the practice of animal experimentation, or "vivisection" as popular terminology has it.

The postulate of the bill is that the dog is the friend of man; that he serves a useful purpose; that he has gone to war, served there, been wounded, decorated and of very material assistance during active operations. The first clause of the proposition we will admit, with reservations; the second with reservations, and as for the third, while some of it is incontestably so, it is not, in toto, in conformance with facts.

Some dogs are the friend of man: not all of them. We have distinct personal recollections of several who were far from friendly and it is probable that, if dog statistics were compiled, it would be demonstrated that the total of unoffending persons bitten by their supposed friends would run into very respectable figures. This, aside from the yearly treatment of rabies, a condition which, it is true, the dog is not responsible for, but which is of sufficient importance in pathology to have given a universal significance to the name of Pasteur.

Some dogs are useful; that is true beyond a doubt, but if they were classified by some cold blooded statistician in reference to the importance of the part they play in the economic scheme of things we have a grave suspicion that the unproductive dogs would far outnumber those who earn their living.

It is true that there were dogs employed in the late war. It is the fact, however, that an undue prominence was given to their importance.

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The type universally conceded to be the best fitted for military use was the "Police dog." The serious disadvantage of this breed is that it is a "one man" dog. Trained by its master it will perform for no one else, the consequence being that if the man, the other side of the equation, is not in evidence the result is zero. Under his direction, this dog can and has carried messages, but never to the exclusion of the "runner service" or the employment of audible or visual signaling. It is a job which primarily belongs to man and the one advantage which the dog has is his "low visibility," to twist a technical term. He was, relatively, as efficient in performing this service, which belongs to his human associate, as man would be if educated up to the same standard in doing some task which is primarily the business of the canine race. He cannot add sensate intelligence to speed and the ability to traverse ground which would be more difficult for man, and to that extent is he inferior. He by no means replaced the faithful, unsung "brancardier," or stretcher-bearer, who was responsible for the first transport of his wounded brother of the line. If we grant that the dog could find a wounded man, we must also admit that it was only his master, man, who could retrieve him, or give him the aid and succor which he needed. We were informed by both the French and British, during our tour of duty in France, that the sphere of usefulness of the dog in war was a very limited one and not to be considered seriously, save as a means of traction for sledges in the snow-covered hills of the Vosges in winter.

We are aware that this is more or less beside the question, but it is in a measure an answer to the phraseology of the bill referred to. The crux of the situation is, of course, the still apparently unsettled question as to whether serious members of the medical profession are justified in the use of animals for experimental purposes with the object of affording increased protection from disease to human beings. To the medical profession in general it would seem that there is but one answer to the question. To those who are familiar with the results obtained from experimental medicine there can be little doubt that the advancement thus gained in both surgical and medical procedure altogether justifies the use of animals for this end. If it did not, would it continue. Is it at all probable that men who are intent on the demonstration of scientific truths would waste their time in hammering away at a method which brought them nowhere. If we admit, and we surely must, that the experimenters have a definite object in view, we should certainly also admit that any means which they consistently employ are those which will demonstrate the truths which they seek, and are not carried out as a means of personal gratification and at the expense of time which might be profitably given to more fruitful measures.

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The very persistence of the method should be its best defense. Evil dynasties, bad laws, undesirable customs fail automatically through the test of time, and those methods which do not bring the results sought are quickly discarded, mainly because they are a waste of valuable time. It would be millennial, of course, if we could go through life without sacrificing anything in order that we might ourselves live, but so long as man is the dominant force, so long as this world is *his* world, it is inevitable that the lesser orders of creation pay tribute. We eat them, and we wear them, and we exterminate those which interfere too much with our convenience or the production of our staple crops.

All this is so much a matter of routine that it is not a matter for "any amazement" save for the occasional protest of the vegetarian. The question of vivisection is not in the established category occupied by our depredations on animal life for the purposes quoted, and for that very reason there will be objection to, and rebellion against it until the majority of mankind recognizes the fact that it is not aimless, wilful cruelty carried on for no good reason and with no tangible result. Vesalius faced the same opposition when he sought to teach anatomy by the dissection of the human body. Who, now gives the matter a second thought save as a rather gruesome means of acquiring accurate information.

The proper use of animals for the demonstration of laboratory truth has received the unqualified support of so many of the foremost minds of our profession that it would seem that some weight should be attached to the expressed opinions. Unfortunately, the majority of the uninformed public content themselves with denying categorically the statements made and the reasons adduced by those who ought to know whereof they speak. It is hardly probable that a man of such world-wide prominence as Dr. W. W. Keen of Philadelphia, or many more of equal eminence, would defend the practice if it were unjustifiable. They are men of too keen perception to be misled by specious reasoning, and it is unthinkable that they should advocate the taking of animal life unless they were very sure that the sacrifice were justified.

The introduction of the bill will undoubtedly call forth more or less comment in the press, and it is these articles, written often by those uninformed or entirely prejudiced, or both, which will specifically attack the profession. What effect these attacks will have is problematic, but they do not make pleasant reading for us of the profession who know, from the standpoint of both men and doctors, the incontestable necessity for the continuance of properly regulated experimentation as an adjunct to didactic methods.

JAMES ROBB CHURCH.

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ASSOCIATION NOTES

At a recent meeting of the Executive Council, the following amendments to the Constitution and By-Laws were approved by a majority of the council and are published below in accordance with Article XI of the By-Laws. Proposed additions in black face type; proposed eliminations in brackets:

CONSTITUTION AND BY-LAWS OF THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES[1]

PREAMBLE

The Medical Officers of the Army, of the Navy, of the Public Health Service of the United States, and of the Organized Militia of the Different States, under the provisions of an act of Congress approved January 30, 1903, *have associated themselves together under the name of "The Association of Military Surgeons of the United States." Now, therefore, pursuant to the laws of the United States, the members of said Association do hereby ordain and enact the following:*

CONSTITUTION

ARTICLE I

NAME

The Association shall be known as "The Association of Military Surgeons of the United States."

ARTICLE II

OBJECT

The object of the Association shall be to increase the efficiency of the medical service of the Army, the Navy, the Public Health Service, and of the Organized Militia of the different States by mutual association and the consideration of matters pertaining to the medico-military service of the United States both in peace and in war.

ARTICLE III

MEMBERS

Classification of Membership

SECTION 1. There shall be Active, Life, Associate, Ex-Officio, and Honorary Members.

Members Eligible to Office and Entitled to Vote

Sec. 2. Active and Life members only are eligible to office or entitled to vote.

[1]Adopted September 26, 1911.

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Active Members

Sec. 3. Active membership is limited to commissioned medical officers of:

1. The United States Army;
2. The United States Navy;
3. The United States Public Health Service;
4. The Organized Militia of the several States;
5. The United States Volunteers.
6. **Ex-medical officers and**
7. **All Medical Members and Medical Examiners of Local Medical Advisory and District Boards, officially appointed by the President of the United States, the Provost Marshal General of the United States Army, and the Governors of the various states for the purposes of the Selective Draft Act.**
8. **Acting Assistant Surgeons (Contract Surgeons) of the U. S. Army, Navy and Public Health Service.**

Active members may retain their membership, should they be honorably discharged from the service in which they have been commissioned, and nothing in this Article shall affect the membership rights of Contract or Acting Assistant Surgeons of the United States Army, Navy, or Public Health Service who were duly elected prior to the adoption of this Constitution.

Life Members

Sec. 4. Life membership and exemption from payment of annual dues is conferred upon—

1. Members who obtain first honorable mention in the prize competitions of the Association.
2. Any active member upon the payment of fifty dollars at one time.
3. Ex-presidents of the Association.

Associate Members

Sec. 5. Associate membership is open to—

[1. Ex-Medical Officers and]

2. Other officers of the aforementioned services;
3. Ex-medical officers of the Confederate Army and Navy;
4. Medical officers of foreign service; and

[5. Acting Assistant Surgeons (Contract Surgeons) of the U. S. Army, Navy and Public Health Service.]

Ex-Officio Members

Sec. 6. The Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Public Health Service,

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in conformity with the Act under which this Constitution is adopted, shall be ex-officio members of the Association.

Honorary Members

Sec. 7. The President of the United States, the senior general officer of the Army, and the senior flag officer of the Navy for the time being, shall be honorary members. Other persons who have rendered distinguished service to the Association, or who have otherwise attained distinction deserving of recognition by the Association, are eligible to honorary membership.

ARTICLE IV

GOVERNMENT OF THE ASSOCIATION

Advisory Board

SECTION 1. There shall be an Advisory Board consisting of the Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Public Health Service and the President of the Association.

Officers

Sec. 2. The officers shall be a President and three Vice-Presidents, [who shall be elected from and represent in regular rotation the Army, the Navy, the Public Health Service, and the Organized Militia;] a Secretary [and a] Treasurer; all of which officers shall hold their respective offices until their successors are elected and qualified.

Executive Council

Sec. 3. There shall be an Executive Council, to consist of the officers and six (6) members, who shall be appointed by the President each year.

Committees

Sec. 4. There shall be the following committes, to be appointed annually by the President, except as hereinafter specified.

A Literary Committee, to consist of seven (7) members.

A Publication Committee, to consist of four (4) members, one of whom shall be the Secretary as ex-officio chairman.

A Necrology Committee, to consist of four (4) members.

A Committee of Arrangements for the next ensuing meeting, to consist of one (1) member, who shall be the chairman, with power to associate with himself such other persons, members of the Association or not, as he may see fit.

A Nominating Committee, based upon a representative or one vote for each State, Territory, the Army, the Navy, and the Public

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Health Service, and for every additional ten (10) members or major fraction thereof an extra representative or vote; said vote or votes to be cast by a member or members, present from each State, Territory, Army, Navy, and Public Health Service, to be designated by the members present from each State, Territory, Army, Navy and Public Health Service at the time of meeting.

A Committee on Legislation to consist of five members, one each from the Army, Navy and Public Health Service, and two members from the Organized Militia, to be nominated by the President and elected by the Association in annual meeting. (Adopted, Annual Meeting, Sept. 13-15, 1915.)

A Sinking Fund Committee to consist of the President, who shall be Chairman, the Secretary-Treasurer, who shall act as secretary and custodian of the fund, and three members to be elected from the former Presidents of the Association, the latter to hold office for three years. Those first elected shall select by lot who shall go out at the end of the first, second and third year respectively, and each year thereafter one member shall be elected to the Committee at the annual meeting of the Association. Vacancies occurring in the interval may be temporarily filled by the Committee.

Boards of Award

Sec. 5. Boards of Award shall be appointed by the President for the consideration of such prize competitions as may from time to time be instituted by the Association. Membership in the Association shall not be required of members of the Boards of Award, which shall be selected in each instance from men conspicuous for knowledge of the subject of the competition.

ARTICLE V

SEALS, INSIGNIA AND ARMS

Seal

SECTION 1. The seal of the Association shall consist of a circle, one and three-eighths (1⅜) inches in diameter, charged with the cross of the insignia with the words, "Organized 1891, Incorporated by Congress 1903," within a circumferential band bearing the words, "Association of Military Surgeons, United States."

Insignia

Sec. 2. The insignia of the Association shall comprise (1) a Cross; (2) a Ribbon.

(1) The Cross shall be of gold, the obverse enameled with red and bordered with gold, upon which shall be superimposed a white shield, inclosing a shield of the United States in its proper colors—red, white

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and blue with stars of gold—surrounded by the motto, "Omnia pro Patriæ Caritate;" the reverse, plain gold and bearing its number. Upon the reverse may also be engraved the name and address of the owner. The cross, suspended by a ribbon, consisting of two bands of crimson inclosing a band of white, may be worn by any member of the Association on ceremonial occasions, and shall be carried on the left breast—or at the collar, if the wearer be an officer of the Association.

The Ribbon

(2) The ribbon to be worn with civilian dress shall consist of a piece of ribbon 3/16 of an inch wide of the official colors of the Association, to be tied in the upper left hand button hole of the civilian coat and around the lapel with the knot to the rear.

The Coat of Arms

Sec. 3. The Coat of Arms shall be as follows: Quarterly. First: Sanguine, a caduceus or; for Army. Second: Or, an oak leaf and acorn proper; for Navy. Third: Agent, a caduceus and an anchor in saltier azure; for Public Health Service. Fourth: Azure and argent, the Union as borne on the American Flag; for the Organized Militia.

Surcharge.—The Badge of the Association, proper.

Crest.—An Eagle displayed, proper, bearing on breast a Geneva Cross.

ARTICLE VI

QUORUM

Thirty-five (35) members shall constitute a quorum for the transaction of business, but a less number may adjourn.

ARTICLE VII

AMENDMENTS

All amendments to this Constitution shall be proposed in writing at one annual meeting and [voted on at the next]. A three-fourths vote of all the members present at the annual meeting shall be necessary for adoption.

ARTICLE VIII

SINKING FUND

Such funds belonging to the Association as are not needed in current requirements shall be placed in the hands of a Committee to be known as the Sinking Fund Committee. The Sinking Fund shall be invested in Government or other bonds approved by the Committee, or deposited in an approved Trust Company until so invested and no money shall be withdrawn from this fund except upon a majority vote of the Sinking Fund Committee and of the Executive Council voting

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separately in session or by letter. When withdrawal is thus approved, it shall be made by an order on the Secretary-Treasurer signed by the President of the Association. The custodian (Secretary-Treasurer) of the fund shall be bonded in such sum as the Committee shall determine, and his accounts, and the securities and funds shall be audited annually and at such other times as the Committee requires.

BY-LAWS

ARTICLE I

ELECTION TO MEMBERSHIP

Active or Associate Membership

SECTION 1. Election to active or associate membership shall be by the Executive Council, to whom the Secretary-Treasurer shall refer all applications, together with such credentials as may be presented.

Honorary Membership

Sec. 2. Election to honorary membership shall be by a two-thirds vote of the Association, after the unanimous recommendation of the Executive Council.

ARTICLE II

Expulsion from Membership

Any member who may be dismissed from the service for conduct unbecoming an officer and a gentleman, or who may be guilty of such conduct though then not a member of the service, shall be expelled and debarred from any further rights or privileges when proper proof has been furnished.

ARTICLE III

Meetings

The Association shall meet annually, the time and place to be fixed at each meeting for the one ensuing. Special meetings may be called by the President at any time. At the annual meeting the President, and Vice-Presidents [and Treasurer] shall be elected for the term of one year, the Executive Council and standing committees appointed, and the annual reports received.

ARTICLE IV

DUES AND FEES

Admission Fee

SECTION 1. The admission fee to be paid by active and associate members shall be [five] one dollars [($5.00)], $1.00, which shall accompany the application for membership. [This shall include subscription to THE MILITARY SURGEON for one year.] Should the ap-

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plicant desire to receive THE MILITARY SURGEON, the official journal of the Association, for one year, the amount to be sent with the application for membership should be four dollars ($4.00).

Annual Dues

Sec. 2. The annual dues shall be one dollar ($1.00), due on the first of January of each year. No annual dues shall be required of new members for the remaining portion of the calendar year in which their admission fees have been paid. Delinquency for two years shall terminate membership, after due notice by the Secretary-Treasurer. Provided that in the case of members who have resigned or have been dropped for non-payment of dues under Section 2 of this article, such members may be readmitted without payment of a second entrance fee and upon payment of delinquent dues.

Members Exempt from Dues

Sec. 3. Honorary, Ex-Officio, and Life Members shall be exempt from the payment of dues.

Official Journal

Sec. 4. The annual subscription to the official journal by members of the Association shall be three dollars ($3.00), payable in advance, and the journal shall be stopped on expiration of unrenewed subscription.

ARTICLE V

DUTIES OF THE ADVISORY BOARD

The Advisory Board shall meet at such times as the interests of the public service may demand. Meetings may be called by one or more members of the Board and three members shall constitute a quorum. Any action taken by the Board shall be reported to the Association through the President of the Association.

ARTICLE VI

DUTIES OF OFFICERS

The President

SECTION I. The President shall preside at all meetings, appoint all committees, unless otherwise provided for, approve all proper bills, and perform such other duties as are usually incumbent upon such an officer.

The Vice-Presidents

Sec. 2. The Vice-Presidents in order of seniority shall perform the duties of President in the absence or inability of that officer.

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*The Secretary-*Treasurer

Sec. 3. The Secretary-Treasurer shall keep the minutes of the meetings, the records and archives of the Association; receive all applications for membership and refer them to the Executive Council; [notify the Treasurer of the election of active and associate members;] issue certificates of membership to active, associate, and honorary members on election, and to life members [when advised by the Treasurer that the necessary fee has been paid]; and shall hold office until his tenure is terminated by resignation or death, or by the election of his successor after due and timely notice.

He shall be a member and ex-officio chairman of the Publication Committee.

He shall appoint an Assistant Secretary each year, and shall present an annual report.

He shall be editor of the official journal.

[*The Treasurer*]

[Sec. 4.] The Secretary-Treasurer shall receive all moneys due the Association, collect all assessments, and pay all bills which have been properly approved, except as provided in Article X.

The accounts of the Secretary-Treasurer shall be audited by a committee appointed for that purpose on or before the annual meeting, and at such other times as the Executive Council shall require. He shall present an annual report in which he shall state the number of members for each Service in the following classes: Life members; Active members in good standing; Active members delinquent, resigned, died, and dropped under Article IV, Sec. 2, of the By-Laws. Said report shall show all receipts, disbursements and outstanding debts of the Association.

Members in good standing shall be those who have paid all their annual dues at date of the last audit of the Secretary-Treasurer's account and none other shall be allowed to vote or be counted for votes in the annual or special meetings, except by authority of the Executive Council, in each case where dues have been paid after that date. Adopted, 1915 Annual Meeting.

He shall be custodian of the Sinking Fund.

He shall execute such bond as may be approved by the Executive Council for the faithful performance of his duties, the Association to bear the cost of this insurance.

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Article VII

THE EXECUTIVE COUNCIL

Duties

Section 1. The Executive Council shall be charged with the conduct of the affairs of the Association during the intervals between the annual meetings, shall elect active and associate members, and perform such other duties as may be assigned to it by the Constitution and By-laws or by vote of the Association at any stated or special meeting. It shall temporarily fill all vacancies occurring among the officers of the Association between annual meetings.

Conduct of Business

Sec. 2. The business of the Executive Council may be conducted by correspondence or at such meetings as may be called by the chairman upon his own initiative or at the request of any three members. The Secretary-Treasurer shall keep a record of such correspondence and of the minutes of the meetings of the Council.

Officers

Sec. 3. The President and the Secretary-Treasurer of the Association, respectively, shall be ex-officio chairman and secretary of the Executive Council.

Quorum

Sec. 4. Five members of the Executive Council in meeting shall constitute a quorum for the transaction of business. In correspondence a majority of the whole Council shall govern.

Article VIII

DUTIES OF COMMITTEES

Section 1. The Literary Committee shall outline the literary work for the annual meeting in advance, making the necessary arrangements for the reading and discussion of papers.

The Chairman shall be responsible for the program for the ensuing meeting.

The Committee shall assist the Publication Committee in the prompt publication of the Proceedings.

The Publication Committee

Sec. 2. The Publication Committee shall have charge of the publications of the Association.

It shall determine what portions of the proceedings are of sufficient general interest to be printed and decide upon the advisability of

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publishing the several papers presented at the annual meetings, and such other matter as may be of value to the Association.

The Necrology Committee

Sec. 3. The Necrology Committee shall report to the Association, at each annual meeting, the deaths that have occurred during the preceding year among the members of the Association, with a suitable memoir in each case.

The Committee of Arrangements

Sec. 4. The Committee of Arrangements shall have charge of all local arrangements for the annual meetings of the Association.

The Nominating Committee

Sec. 5. The Nominating Committee shall, at the annual meeting, present a list of candidates for the various offices for the ensuing year.

The vote or votes of the Nominating Committee shall be cast by a member or members present from each State or Territory, the Army, the Navy, and the Public Health Service.

Article IX

Duties of Boards of Award

Boards of Award shall be charged with the selection of the person or persons to whom prizes shall be awarded, in accordance with the regulations of such prize competitions as may, from time to time, be instituted, and shall report the results thereof at such time as may be designated by the Association.

Article X

The Journal of the Association

The Association shall publish a monthly journal to be known as The Military Surgeon, in which shall be printed the proceedings of the annual meeting and such other matter as is determined upon by proper authorities. The cost of the journal shall be paid by an allotment of Association funds to be made on a budget submitted by the Editor and approved by the Executive Council.

The Secretary-Treasurer shall be ex-officio Editor of the journal and may appoint, with the approval of the Executive Council, such associate Editors and Collaborators as he finds necessary or desirable in conducting its publication.

He shall receive such monies accruing from subscribers, advertisers, and other sources pertaining to the journal as are sent to him, shall keep a business record of the same and deposit the money in a bank approved by the Executive Council, in the name of The Association of Military Surgeons of the United States, subject to his order.

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He shall pay such bills as are due in connection with the journal, which have been approved by the President, or an officer of the Association designated by him, [and shall render a monthly account through the President to the Treasurer with his check for any unexpended balance remaining to his account at the end of each month.]

[The Editor shall be bonded in amount determined by the Executive Council and shall submit a report at the annual meeting of the Association, with a statement of his account duly audited by a certified accountant, to be designated by the Executive Council, and such other reports as may be called for by the Council.]

Article XI

AMENDMENTS

All proposed amendments to these by-laws must be forwarded to the Secretary-Treasurer, who will present them to the Executive Council at least three months before the next annual meeting. The proposed amendments and views of the Council shall be published in the journal of the Association not later than one month before the annual meeting, at which meeting they may be adopted by a three-fourths vote of all the members present.

Article XII

ORDER OF BUSINESS

1. Reading of records of previous meeting.
2. Appointment of Committees.
3. Report of Executive Council.
4. Report of Secretary-Treasurer.
[5. Report of Treasurer.]
5. Report of Editor.
6. Report of Standing Committees.
7. Report of Special Committees.
8. Unfinished Business.
9. New Business.
10. Literary and Social Program.
11. Election of Officers.
12. Installation of New Officers.
13. Reports of Committees.
14. Incidental Business.
15. Adjournment.

The parliamentary rules governing in the Congress of the United States shall be the standard of this Association.

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COMMENT AND CRITICISM

CHICAGO, ILL., *July* 10, 1919.

I wish to emphasize the work of the medical profession during the late war. We cannot overestimate its value.

Through the work of modern medicine it was made possible to maintain enormous armies in excellent physical conditions under surroundings which, until recently, would have meant an enormous percentage of disability—such a percentage as would have largely neutralized the fighting value of the troops. Modern surgery has also accomplished marvels in the saving of life and limb, and in the prompt restoration of men to duty.

Never before have the results of preventative medicine and surgery stood out as they have in this war nor have they played so important a part. The great problem in modern war is the placing in the field of an army fit to fight, and maintaining it there in condition to render the best service—for this result the work of the Medical Department has been largely responsible. It has been a great work.

The losses among medical officers have been very heavy. I was told, on the British front in 1918, that the percentage of losses among the medical officers of the British Army (many of whom were from our own country) had been exceeded only by the losses in the infantry.

The work of the Medical Department in this war should lead to the fullest recognition of its importance.

Very sincerely yours,

LEONARD WOOD.

FIRST IMPRESSIONS

It may seem presumptuous for me, at home only two weeks after nearly two years of foreign service, to comment on conditions that are still novel and strange. But, if there is any lesson that one learns in the Army, it is to readjust oneself quickly and easily to sudden transitions and new environment. Home-coming is none the less a severe test.

The man in uniform is soon made aware of the fact that he is no longer a hero; in fact, the well-groomed business man in cits seems to look askance at himself as if he were annoyed at being reminded of the fact that there was, long ago, a war which cost a good deal of money and incidentally 300,000 casualties. Never having been ashamed of that uniform, and not sharing in the prevailing desire to shed it as soon as possible, I have felt equally annoyed.

The minor changes—the fact that there seems to be no vacancy

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crying out for the returning medical officer and that the dollar now literally "looks like thirty cents"—were naturally to be expected. It has been too much the fashion among those who had the great privilege of being overseas to speak somewhat slightingly, if not in a patronizing way, of those who were equally patriotic but less fortunate, and who wear a different service stripe from ours. I had not been twenty-four hours in camp here before I was ready to admit that "all is not gold that glitters." The cheerful performance of hard and irksome duty, for efficiency, for self-sacrifice, I take off my hat to the medical officers who from start to finish have been "on the job" at home.

Their hardest work began when ours ceased—after the armistice—and their record speaks for itself. Personally I am proud to exchange my foreign insignia for the "P. E." which marks the wearer as a member of an honorable guild.

Among the numerous citations, decorations, and other externals, where is the recognition of these worthy officers?

H. C. Coe.

INCONTINENCE OF URINE

About forty cases, sent with the diagnosis "Incontinence of Urine," were treated in the base hospital. These patients were divided as soon as possible into three classes: (1) True enuresis infantilis; (2) incontinence brought on by the unusual military surroundings, the shock from being taken from civil life, and hysteria; (3) the malingerers.

It was rather difficult to place each patient in his correct class. In some cases belonging to the first class we had affidavits from family physicians or near relatives telling us that the incontinence had been present from the patient's infancy. We also had reports from regimental surgeons stating that the patient was a regular bedwetter. Some of these patients were degenerates with a low mental development. The cystoscopic examination showed in more than half of these cases a trabeculated bladder with a slight diverticulum upwards. These symptoms, with the exception of a single case, were not found in any of the other classes.

In the second class we had some cases of incontinence where seemingly strong and healthy soldiers suddenly complained to their regimental surgeons that they were wetting their beds, especially after hard exercise with profuse perspiration followed by a sudden cooling off. Hypersensibility of the bladder wall, caused by reflex action from cooling of the skin of the lower abdomen, may develop a condition in the bladder that causes it to contract with only a small amount of fluid. In a few cases the cause could be traced to the strict military discipline, the

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unusual strain, mental and physical, under which many of these newly enlisted men worked trying to perform their unaccustomed duties as well as possible. Some of these cases started with poluria, which in a short time turned into incontinence. The cystoscopic examination was usually negative.

Certain infectious diseases may cause incontinence. Dysentery was thought to have caused it in two of the patients.

The last class of patients belonged to the third category, the malingerers. There is nothing to be said about them.

The treatment of the first class, true enuresis, did not give any result. The condition is nearly always hopeless.

In the second class good results were obtained by keeping the patient in bed with hot poultices on the abdomen and warm bladder irrigations. The medicinal treatment was atropin. The bromides and opiates did not give any result. The prognosis is usually good exept in cases of long standing where the bladder wall and sphincter have become loose and inactive.

The last class was treated in a different but successful way. When we were certain that the patient was a malingerer he was put on a restricted diet with magnesium sulphate every morning; a large sound was passed and he was turned out of bed every hour during the night and forced to go to the bathroom. Twenty-four to thirty-six hours were usually enough to cause him to make up his mind that he was cured, and he was sent back to his regiment where a recurrence of his trouble was very seldom noted.

If no improvement were noted in the cases of the two first classes after a certain stay in the hospital, they were recommended for discharge.

MAJOR EJNAR HANSEN, M. C.,
Chief of Urological Section,
Camp McArthur, Waco, Tex.

RE-ENLISTMENT

The statement below should be of much interest to former enlisted men of the regular service, now commissioned officers, who will soon be discharged.

Former noncommissioned officers of the regular service now holding temporary commissions which will soon be terminated, as well as those who have already been discharged as officers, may be re-enlisted in the grade from which they were discharged, for the purpose of accepting a commission, and placed on recruiting duty in New York, under authority granted by the War Department, to Col. Wilber E. Wilder, Cavalry, 461 Eighth Ave., New York City, in charge of the New York District.

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MILITARY HISTORY PRIZE

The following is published for the information of any of our readers who may be interested:

The American Historical Association offers a prize of $250 for the best unpublished essay in American military history submitted to the Military History Prize Committee before July 1, 1920.

The essay may treat of any event of American military history—a war, a campaign, a battle; the influence of a diplomatic or political situation upon military operations; an arm of the service; the fortunes of a particular command; a method of warfare historically treated; the career of a distinguished soldier. It should not be highly technical in character, for the object of the contest is to extend the interest in American military history; but it must be a positive contribution to historical knowledge and the fruit of original research.

The essay is not expected to be less than ten thousand or more than one hundred thousand words in length.

It should be submitted in typewritten form, unsigned; and should be accompanied by a sealed envelope marked with its title and containing the name and address of the author, and a short biographical sketch.

Maps, diagrams or other illustrative materials accompanying a manuscript should bear the title of the essay.

The committee, in reaching a decision, will consider not only research, accuracy and originality, but also clearness of expression and literary form. It reserves the right to withhold the award if no essay is submitted attaining the required degree of excellence.

For further information address the chairman of the Military History Prize Committee, Milledge L. Bonham, Jr., Louisiana State University, Baton Rouge, Louisiana.

MILLEDGE L. BONHAM, JR., *Chairman*,
D. R. ANDERSON,
ALLEN R. BOYD,
ALBERT BUSHNELL HART,
FRED M. FLING,
Military History Prize Committee.

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BOOK REVIEWS

THE BLIND: THEIR CONDITION AND THE WORK BEING DONE FOR THEM IN THE UNITED STATES, by Harry Best, Ph.D.; author of "The Deaf: Their Position in Society and the Provision for their Education in the United States." New York: The Macmillan Company, 1919.

In the opinion of their viewer Dr. Best has succeeded in producing a thorough and comprehencesive treatise on an important but heretofore neglected division of sociologic medicine. We have many books dealing with the blind and their care but they are largely of a sentimental nature. The work under review is an examination of the blind and their estate from the point of view of the social economist, a social survey of this unfortunate component of the population. While the book is primarily a scientific inquiry, it contains an abundance of human interest, and it will be valuable alike to the physician, lawyer, legislator, economist, sociologist and philanthropist.

The subject is presented in seven parts as follows: I. General Condition of the Blind; II. Blindness and the Possibilities of its Prevention; III. Provision for the Education of Blind Children; IV. Intellectual Provision for the Adult Blind; V. Material Provision for the Blind; VI. Organizations Interested in the Blind; VII. Conclusions with Respect to the Blind.

The text is clear and logical, the references abundant, and the typographical work satisfactory.

FRANCIS M. MUNSON.

ELECTRICITY IN MEDICINE—A Practical Exposition of the Methods and Use of Electricity in the Treatment of Disease, Comprising Electrophysics, Apparatus, Electrophysiology and Electropathology, Electrodiagnosis and Electroprognosis, General Electrotherapeutics and Special Electrotherapeutics, by George W. Jacoby, M.D., Former President of the New York Neurological Society and of the American Neurological Association; Consulting Neurologist to the Lenox Hill Hospital, etc., etc.; and J. Ralph Jacoby, A.B., M.D., Fellow of the New York Academy of Medicine, Member of the American Medical and the American Medico-Psychological Associations; Chief of Clinic, Neurological Department, Lenox Hill Hospital, etc., etc. With 262 illustrations. Philadelphia: P. Blakiston's Son & Co. Price, $5.

The authors have produced an eminently practical and useful book which will be a valuable addition to the library of every physician who desires to utilize electricity as a remedial agent. It is divided into six parts as follows: I. Electrophysics; II. Apparatus Required for the Therapeutic and Diagnostic Use of Electricity; III. Electrophysiology and Electropathology; IV. Electrodiagnosis and Electroprognosis; V. General Electrotherapeutics; VI. Special Electrotherapeutics.

The work is confined rather closely to electricity in medicine in contradistinction to surgery. For this reason nearly all surgical references have been excluded, and the subjects of X-rays and phototherapy have not been deeply considered.

The illustrations are all that could be desired, the text is clear, and the typographical work of a high order.

FRANCIS M. MUNSON.

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A TEXT-BOOK OF PRACTICAL THERAPEUTICS—With special reference to the application of remedial measures to disease and their employment on a rational basis, by Hobart Amory Hare, M.D., B.Sc., Professor of Therapeutics, Mater Medica, and Diagnosis in the Jefferson Medical College of Philadelphia; Physician to the Jefferson Medical College Hospital; One-time Clinical Professor of Diseases of Children in the University of Pennsylvania; Surgeon, U. S. N. R. F. Seventeenth edition, enlarged, thoroughly revised, and largely rewritten. Illustrated with 145 engravings and 6 plates. Philadelphia and New York: Lea and Febiger.

The medical profession gladly welcomes the new edition of Dr. Hare's book that has been so well and favorably known during the past thirty yers. The present edition has required so many alterations and additions that a large part of it has been reset in new type. Among other additions and changes are noted the following: Greater consideration of the technique of intravenous injection and direct transfusion is given than before. The use of Dakin's fluid and dichloramine-T by Carrel's method and the treatment of burns by parafine are discussed for the first time. The methods of prescribing a proper diet for the sick are described more in detail than formerly, particularly in respect to children and diabetics. Many important drugs heretofore made in Germany, or under German patents, are now made in this country and have been given names whereby they may be properly designated, as, for example, arsphenamine for salvarsan, and procaine for novocaine, and these changes have been included in the new edition.

FRANCIS M. MUNSON.

HYGIENE AND PUBLIC HEALTH, by George M. Price, M.D.; author of "A Handbook of Sanitation," "Tenement House Inspection," "Hygiene and Sanitation for Nurses," "The Modern Factory," Director, Joint Board of Sanitary Control. Second edition, thoroughly revised. Philadelphia and New York: Lea and Febiger, 1919. Price, $1.50.

In the second edition of his useful little epitome Dr. Price has given the essential parts of the science of hygiene and has very wisely not attempted to cover the whole field. He has brought the text up to date, the most important changes being in the chapter on Prevention of Infectious Diseases. By the use of bold-faced type heading the sections, subsections and paragraphs, the author has made any desired subject easy to find. A brief work but of high character.

FRANCIS M. MUNSON.

A TREATISE ON ORTHOPEDIC SURGERY, by Royal Whitman, M.D., M.R.C.S., Eng., F.A.C.S., Director of Military Orthopedic teaching; Chairman of the Medical Advisory Board for Orthopedics in New York City; Associate Surgeon to the Hospital of St. John's Guild; Consulting Surgeon to St. Agnes' Hospital for Crippled and Atypical Children, White Plains, to the New York State Board of Health; Member of the American Orthopedic Association; Corresponding Member of the British Orthopedic Society; Member of the New York Surgical Society, etc. Sixth edition, thoroughly revised; illustrated with 767 engravings. Philadelphia and New York: Lea and Febiger, 1919. Price, $7, net.

Whitman's Orthopedic Surgery is probably the most deservedly popular single-volume treatise on orthopedic surgery which has appeared in the English language. That it has been found necessary to issue a new edition within two years of the last is evidence of the progressive spirit of the publication.

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Few changes are noticed in the main text of the book from the last (fifth) edition. There has been added, however, an interesting and valuable chapter of fifty-four pages on Military Orthopedic Surgery.

First, the types of cases officially belonging to the orthopedic department of military surgery are described, such as ununited and mal-united fractures, disability of the joints, injuries of the muscles, ligaments and tendons, deformities of the feet, etc. The author makes a statement, quoting Starr, that it has been estimated that 20 per cent of all casualties are of an orthopedic nature; that 70 per cent of returned surgical cases are of this class, and that in 20 per cent of these, operations are required.

Variations from the normal and diseased conditions which would reject an applicant for registration are given in discussing the spine, the sacro-iliac and lumbosacral joints, scapulae and extremities.

The subject of fractures is then taken up; apparatus suitable for the different types is illustrated and described; also the operative repair of fractures, including the use of bone grafts.

There is a valuable description of the preparation of stumps for artificial limbs; also an illustrated description of Vanghetti's kineplastic amputations. A brief, up-to-date discussion of injuries to the nerves and their treatment operative and mechanical, will be found interesting and instructive. The best routes of approach to the different nerves of the extremities are described and well illustrated by excellent cuts borrowed from Gerish's Anatomy. Whitman also uses cuts from the same book to illustrate his tendon transplantation for paralysis of the median nerve.

As to "Attitudes of Election," Whitman says: "Deformity is an almost inevitable result of the more severe types of disease that directly or indirectly involve the locomotor apparatus, the more constant factors in its causation being the force of gravity, muscular contraction and the postures assumed in accommodation to weakness and discomfort.

"There is a standard position for each joint which best adapts the limb for functional usefulness when motion is lost or seriously impaired. This attitude should be assured as long as the tendency to deformity persists, and it should be restored as soon as possible if it has been lost."

Different suspension frames and traction splints are illustrated, and numerous other forms of apparatus are pictured, including the Schede splint for the after treatment of injuries in the neighborhood of joints, which is taken from Mayer's book on the Orthopedic Treatment of Gun-Shot Injuries, recently reviewed in these pages. Other forms of apparatus recommended are of the Thomas-Jones type.

Several pages are devoted to reconstructive treatment, using the term in the sense of the final adaptation of the disabled member to the functions for which it may be capable.

JNO. E. SUMMERS.

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INSTRUMENTS AND APPLIANCES

AN APPARATUS FOR THE CARREL-DAKIN NEGATIVE PRESSURE TREATMENT OF EMPYEMA

By Major JOHN E. CANNADAY, M. C.
Chief of Surgical Service, Base Hospital, Camp Sherman

(With three illustrations)

The combination of Carrel-Dakin irrigation with negative pressure, as described by Deiderich,[1] Moschowitz[2] and Mozingo,[3] has been so highly satisfactory in the treatment of empyema that many surgeons will be interested in some assembly of apparatus that is easy to handle and positive in action. The following described apparatus has been personally tried out in the U. S. Army hospitals at Fort Sheridan and Camp Sherman and has been found to be exceedingly satisfactory and easy of control. It consists mainly of a large carboy in which a vacuum has been made by the use of the ordinary filter pump such as is used in most laboratories (this is connected by rubber tubing equipped with Mohr pinch cocks and is in turn connected with a smaller vacuum bottle intended for the collection of the pus drainage and washings of the empyema cavity), several straight glass connections, also a glass Y-tube connecting both with the Carrel-Dakin irrigator and the drainage bottle. Two patients can easily be connected up with the same irrigator. If desired, the amount of vacuum can easily be regulated by the use of a millimeter column of mercury or by the ordinary standard vacuum gauge, which may be connected with one or both of the vacuum bottles. Ordinarily the large carboy is used as a reservoir from which to replenish and regulate the vacuum in the collecting bottle. In event of a filter pump not being available, the vacuum can be maintained by the use of a syringe, although the latter method entails the expenditure of a considerable amount of labor.

We have generally used the apparatus in the following manner. As soon as it has been definitely established that the empyema cavity contains pus, a 16 French soft rubber catheter is inserted into the cavity by the use of the Deiderich trocar. The catheter is connected with the vacuum bottle and the pus drawn off gradually so as to minimize the disturbance of the lung. Normal saline solution is slowly introduced and the symptoms of bronchial fistula are watched for; in case none are noted, the cavity is irrigated until the solution returns clear. Carrel-

[1] Deiderich, Victor P: Surgery, Gynecology and Obstetrics, vol. 28, p. 362.
[2] Moschowitz, Alexis V.: Surgery, Gynecology and Obstetrics, vol. 28, p. 337.
[3] Mozingo, Arvine E: Jour. A. M. A., vol. 71, p. 2062.

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Dakin irrigations are then begun and continued at sufficiently frequent intervals to eliminate the infection and toxemia incident to pus in the pleura cavity. This often requires irrigations every hour or every two hours during the day, and every two hours at night. Ordinarily enough solution is allowed to flow into the empyema cavity to nearly fill it, and the fluid is allowed to remain from five to ten minutes. During this time the patient's shoulders are lowered, and he is encouraged to turn from side to side in order that all parts of the cavity may come in contact with the fluid. The solution is then withdrawn. During the intervals between the irrigations a moderate vacuum is usually maintained on the tube in the chest, the degree of vacuum being regulated so as not to cause discomfort to the patient (the degree of vacuum will have to be varied according to the individual). The maintenance of a more or less constant negative pressure gives the patient material assistance in the expansion of the lung. Meltzer[4] suggests that in the average case a negative pressure sufficient to lift 5 or 6 mm. of mercury will give a proper amount of pull on the lung. The size of the empyema cavity should be frequently checked by the use of the fluoroscope and by X-ray negatives. Air does not usually begin to leak around the catheter for from twelve days to two weeks, and the leaks can be easily controlled by the use of adhesive plaster. When smears and cultures from the cavity have been reported negative for five or six days in succession, the catheter is usually removed from the cavity; in case the cavity is large, the catheter may later have to be reinserted through the original opening in order to bring a renewed infection under control The smaller cavities often close, remain sterile and even disappear in a relatively short time, while rib resection may ultimately have to be resorted to in the case of some of the larger cavities.

[4] Meltzer, Simon J.: Personal communication.

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VACUUM GAUGE

(To face page 363.)

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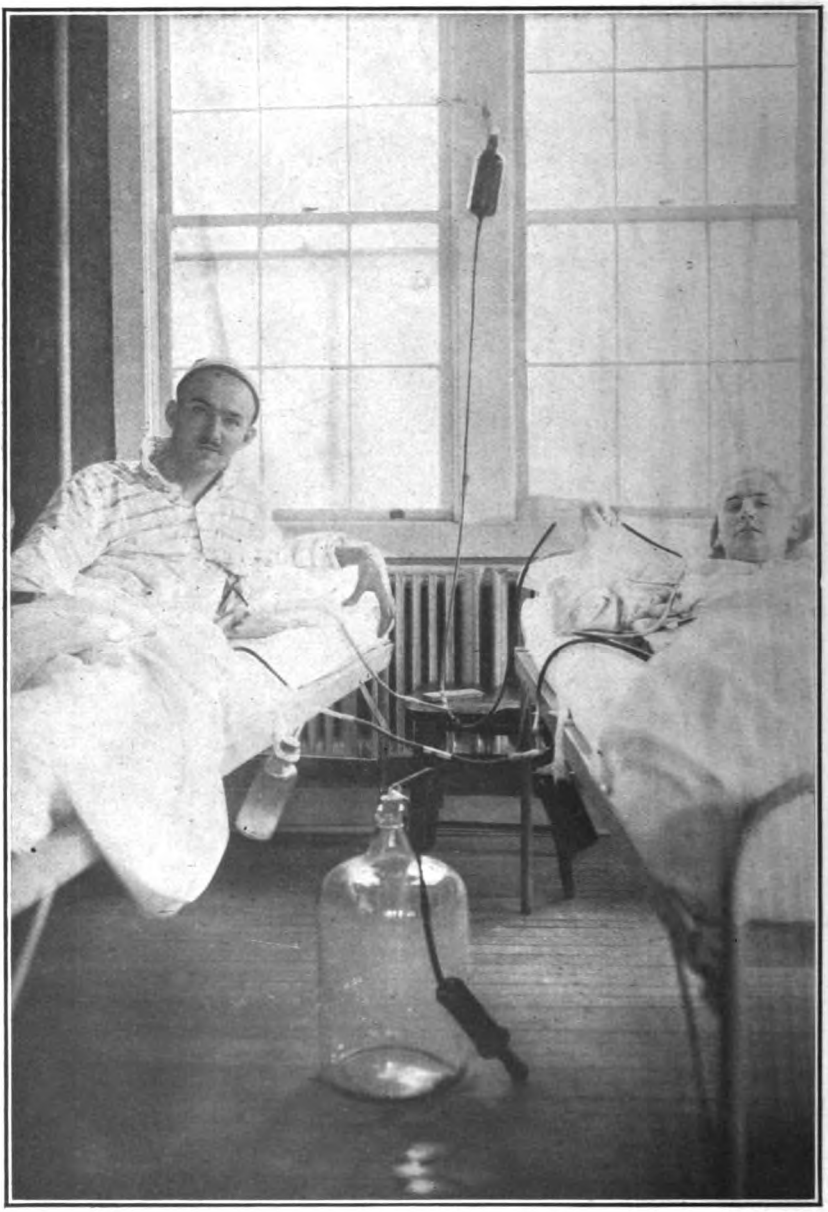

NEGATIVE PRESSURE IRRIGATION ASSEMBLY

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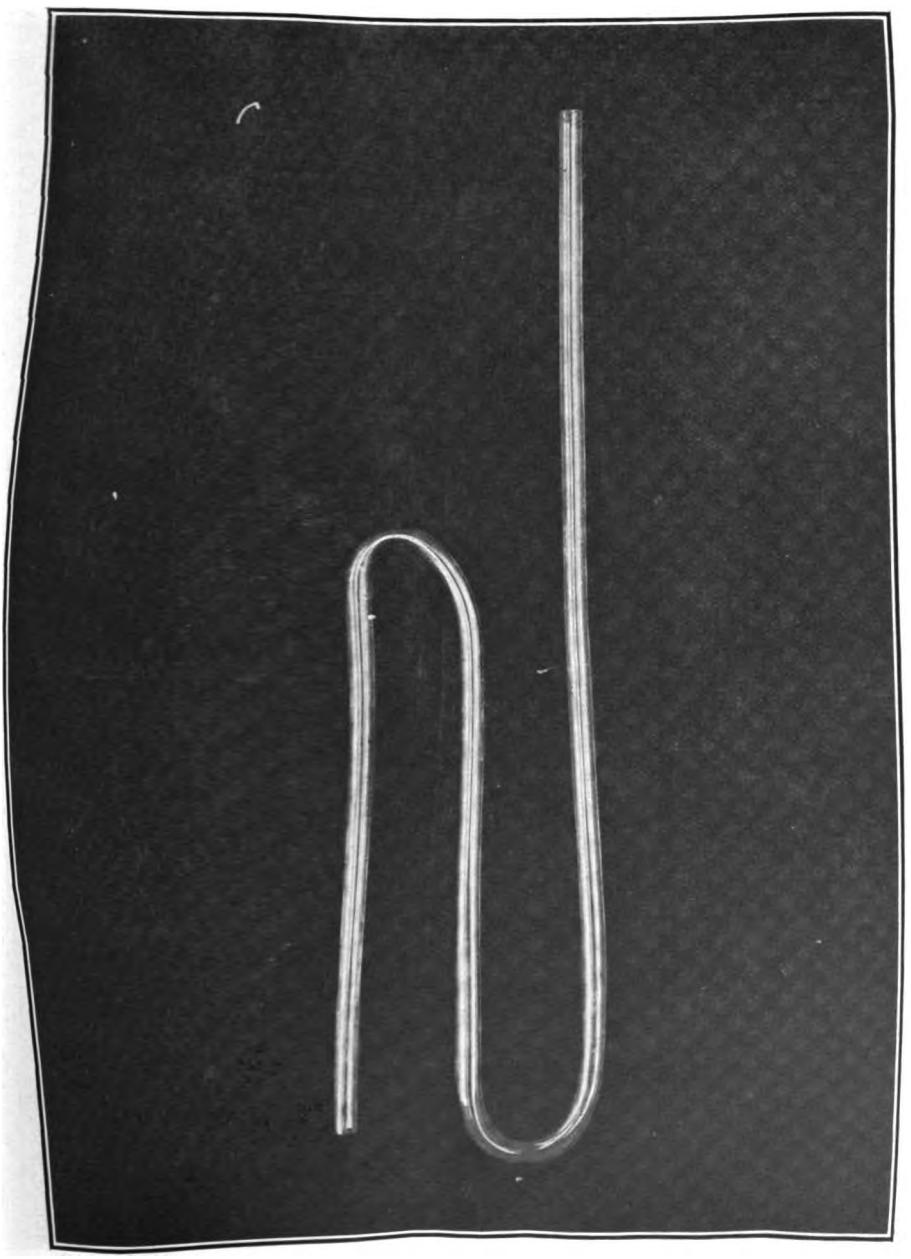

MILLIMETER TUBE FOR COLUMN OF MERCURY

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THE
MILITARY SURGEON

VOL. XLIV OCTOBER, 1919 NUMBER 4

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

A SANITARY SURVEY OF CAMP JACKSON, S. C.[1]

BY MAJOR EDWARD J. SCANNELL
Medical Corps, United States Army

(With five illustrations

The following article deals with a phase of work which falls of necessity at times on the shoulders of the medical man as well as on the sanitary engineer. Prevention is far more rational than cure and its importance in regard to personal health grows rather by geometric than arithmetic proportion as the number of men in a given locality increases. Sanitation for the casual camper or the small party is a simple proposition, but the proper care of any considerable number assembled in any one locality is influenced not only by the condition of the terrain in which they live but also by the measures which are instituted for adapting the human element to the surroundings.

While the general principles of sanitation are well known to all of us and each of us is probably capable of working out his own system of procedure, it is a distinct advantage and help to know any system or method which has already been satisfactorily made use of.

The following article dealing with this question in detail should serve in the nature of a monographic text-book for those who are now, or may be in the future, called upon to solve similar problems.—THE EDITOR.

CAMP JACKSON, S. C., is situated some 5 miles east of Columbia, the state capital, in longitude 81° West and latitude 34° North. The camp proper covers an area of approximately 3 square miles in the valley of the Congaree River. It lies on the edge of the coastal plain at an altitude of some 150 feet above sea level.

The nature of the country is rolling and swamps were prevalent not only within the camp limits but in the territory immediately surrounding it. The *timber* of the region is for the most part the long-leafed pine. The *soil* consists of a layer of sand of varying depth superimposed upon a sub-stratum of red clay. The *climate* is equable with no marked sea-

[1] The writer's purpose in making this survey is to cover, in a general way, the various sanitary measures employed in safe-guarding the health of the command during the period from May 1, 1918, to May 1, 1919, in hope that our experience may offer some suggestions of value to those interested in matters pertaining to public health.

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sonal changes. The average mean temperature for 1918 was 64° F. The maximum temperature 101° F. and the minimum 6° F. were registered by the U. S. Weather Bureau. The summers as a rule are hot and humid, while the winter season is mild and open; rainfall as shown by the weather bureau averages 47.64 inches for the year.

Population.—The average population for the period was 30,000, consisting of whites and blacks. Strength of the command fluctuated greatly from month to month, especially at the height of the emergency when troop movements were numerous and rapid.

Population curve shown in graph in appendix.

WATER SUPPLY

The camp supply is derived from the city of Columbia and delivered through one 16-inch cast-iron pipe, with a capacity of 3,000,000 gallons per day.

The *source* of water is the Congaree River from a point directly opposite the city and just below the confluence of Broad and Saluda Rivers to form the Congaree.

The watersheds of the above-mentioned rivers are not thickly populated and have no large settlements nearer than 75 miles above the city of Columbia.

All water is treated by sedimentation, coagulation, filtration and chlorination.

The water is first pumped from the river into a sedimentation reservoir of 60,000,000 gallons capacity, where it is supposed to remain a sufficient length of time to allow much of the suspended material to settle out before passing on to the coagulation basins. Unfortunately the bottom and sides of the reservoir are of earth, which fact, added to the natural deposition of material, encourages the formation of channels in course of time, thus short-circuiting water from intake and carrying it almost immediately to outlet, allowing little or no sedimentation.

From the sedimentation reservoir the water passes through the mixing chamber where alum is added (from ½ to 1 gr. to the gallon) to coagulating basins of concrete construction. Here the water is detained a short time (estimated thirty to forty minutes), evidently not long enough, however, since coagulated material in large amounts can be seen passing over weir on to the filter beds.

The filtration plant consists of mechanical filters each with a capacity of something over 1,000,000 gallons per day.

Bacterial determinations of effluent from filters are made daily, covering both quality and quantity of bacteria.

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For the period under discussion the filters have proved on the whole satisfactory; total count for bacteria on agar, averaging not over ten per cubic centimeter for months at a time. As for B. coli, evidence of same is almost never found even in 10 c.c. samples.

Chlorination.—In addition, liquid chlorine is added to effluent from filters in proportion of 0.4 parts per million.

Finally water reaches the clear water basin (concrete construction of 2.8 million gallons capacity), where aeration, sunlight and dilution help in providing a good potable water.

No water-borne diseases have been present in camp during the period under consideration.

The results of examination of two specimens of water, one the raw river water, the other tap water, after filtration and treatment, are shown as evidence of the apparent efficiency of filtration plant.

WATER

Raw River Sample, April 15

	Parts per million
Alkalinity	20
Turbidity	400
Color	6
Iron	0.45
Total hardness	17.5
Chlorides	5

Amount of water	Lact. broth. gas % hours	Endo hours	Lact. broth. gas hours
	24–48	24	24–48
1 c.c.	35–35	100	40
0.1 c.c.	15–15	100	.....
.01 c.c.	0– 0	.....	.....

Calories per c.c. after 24 hours at 37° C. on agar.....300
Red calories per c.c. after 24 hours at 37° C. on Lit. lact. agar.....150
Voges—proskauer; Positive. Methyl Red; Negative

Sample from Tap of (Filtered) Treated Water, April 15

	Parts per million
Alkalinity	20
Turbidity	2
Color	3
Iron	0.45
Total hardness	7.5
Chlorides	5.0

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Amount of water	Lact. broth gas % hours	Endo
	24–48	
0.1 c.c.	0– 0	
1.0 c.c.	0– 0	
10 c.c.	0– 0	
10 c.c.	0– 0	
10 c.c.	0– 0	
10 c.c.	0– 0	
10 c.c.	0– 0	

Calories per c.c. after 24 hours at 37° C. on agar.....0

Graph on following page shows water and sewage curve applied to curve of total population during year, from May 1, 1918, to April 30, 1919. The reason for water and sewage curve not following population curve for period June to December was due to the fact that no more water was available since the capacity of pipe was only 3,000,000 gallons per day.

DISPOSAL OF HUMAN, DOMESTIC AND ANIMAL WASTES

Human.—A water carriage sewerage system cares for most of these wastes, operating by gravity except in one small area of camp, where it is necessary to use pumps.

All sewage, which consists of some storm water, ground water, liquid wastes from kitchens and for the most part human excrementitious material, is discharged into a concrete septic tank at the extreme southwestern end of the camp. This consists of eight separate chambers where suspended material, mostly organic in nature, is supposed to undergo sedimentation and digestion before being discharged into Gills Creek, which eventually finds its way into the Congaree River some distance below the city of Columbia.

The treatment of sewage by means of septic tank has not proven satisfactory, one reason being that the tank was undoubtedly too small to care for the work thrown upon it (it was designed to care for wastes from about 40,000 persons) since during the summer and fall of 1918 demands upon it were much increased.

Another important factor operating against the success of the tank was, no doubt, lack of expert supervision.

As a result of inability of the septic tank to fulfil its purpose organic material was deposited all along the banks of Wild Cat and Gills Creeks, also scattered over the land, thus bringing about a nuisance both from the standpoint of odors and attracting and breeding flies.

However, although much organic matter was deposited along the

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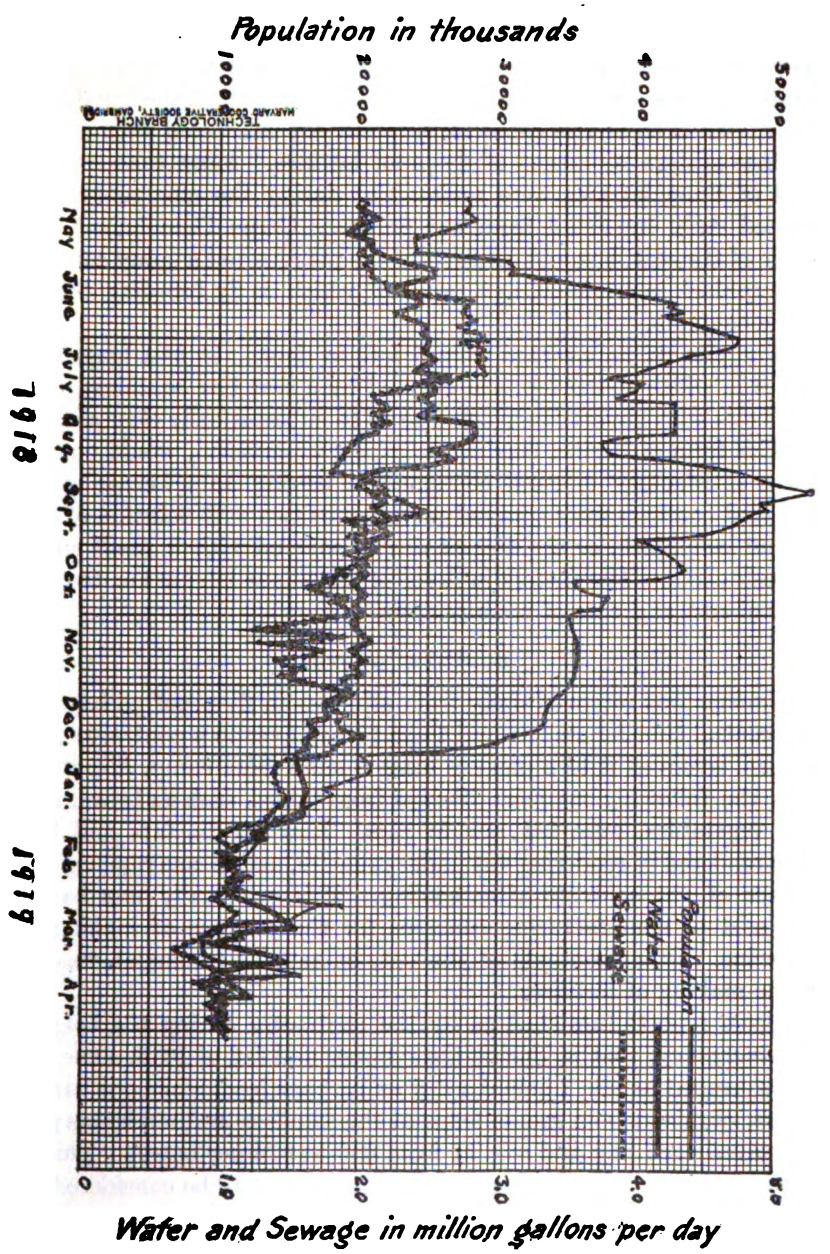

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banks of Gills Creek, so far as can be learned no harm resulted as regards the health of those living along its course. Nevertheless, the above condition was not entirely satisfactory and might under some conditions produce a distinct menace to the health of the inhabitants.

Human excreta was cared for in areas not connected with a water-carriage system by means of fly-proof latrines. More than one hundred of these latrines were maintained during the emergency, being cleaned daily by detail from our Sanitary Corps Detachment. The inside of the seat, box and contents of the pit received a spray consisting of lampblack in crude oil, as a result of which no fly breeding occurred in the contents.

The pits on an average were 6 feet in depth, 14 feet long, by 24 inches in width at the top, and covered by a seat box containing seven seat holes with covers constructed so as to automatically close after use.

This form of latrine, needing no expert supervision, would no doubt prove satisfactory in rural communities having no sewerage system, provided contents were sprayed each day or two with solution of crude oil and lampblack, or the deposit simply covered with a small amount of fresh earth. The factors in favor of the above latrine are the small original cost and ease of maintenance.

DOMESTIC WASTES

Garbage was removed daily from all areas in fly-proof garbage cans to a central transfer station and there turned over to a contractor, who, in turn, removed it to a piggery some 5 miles from camp, disposing of it in the following manner: Scraps from tables, such as bread, meats and vegetables, were fed raw to pigs. Raw meats, fats and bones were rendered in rendering vat under pressure, and grease removed from surface of vat contents after cooling. This eventually was barreled and sold to manufacturing concerns for the purpose of making into glycerine. Other contents of the vat, on settling (tankage), was used in the making of fertilizer.

From reports furnished us by the contractor during the height of the emergency, that is, during the summer and fall of 1918, some 1,800 pigs averaged to gain 1 pound a day on garbage feed; while one barrel of grease, obtained from grease traps at the kitchens and rendering plant, was saved each day and sold at from $50 to $75 per barrel. This was in addition to fertilizer, which in itself is an asset to be considered.

It would appear that the above system is an admirable one, in that it meets the ends of conservation, also removing from the command (or community) what otherwise might prove to be a menace to the health of the inhabitants.

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It is appreciated that the cost of such a system might be considered prohibitive by many municipalities at any time other than the emergency period through which we have just passed. However, it is reasonably certain that nearly all costs might be readily covered by the municipality maintaining its own piggery and rendering plant, which should, of course, be maintained on a business basis.

The graph on following page shows amount of garbage in pounds as applied to the total population salvaged in camp during the six-months period, August, 1918, to January, 1919, inclusive.

ANIMAL WASTES

Manure.—All manure was removed from stables, picket lines and corrals daily; being carried to a central designated spot at Auxiliary Remount Depot by organization wagons and there turned over to a contractor, who either had it loaded at once on cars and shipped out of camp to farmers in the surrounding country, or had it dumped on the farm just outside of camp, where it was supposed to be spread and plowed under the same day.

The above methods, properly carried out, dispose of the manure problem in a very effective and sanitary manner.

A compost pile was formed during the latter part of 1918 just outside the limits of the camp (to care for certain surplus manure) against the advice of the sanitary officer, and it has proved very unsatisfactory, since, in spite of half hearted measures to properly care for same, flies have continued to breed during the greater part of its existence.

REFUSE

All trash was removed daily to one of two officially maintained dumps and burned. The dumps were well cared for and gave very little trouble.

ASHES

Coal ashes were used for filling depressions, afterwards being covered with earth.

Wood ashes were reclaimed for soap making.

PAPER

Newspapers were reclaimed, baled and sold. However, this did not prove a profitable undertaking.

FOODSTUFFS

Only canned or pasteurized milk was allowed in camp, and milk, as well as milk products, such as ice-cream, was examined at regular intervals, both in camp and in the city of Columbia.

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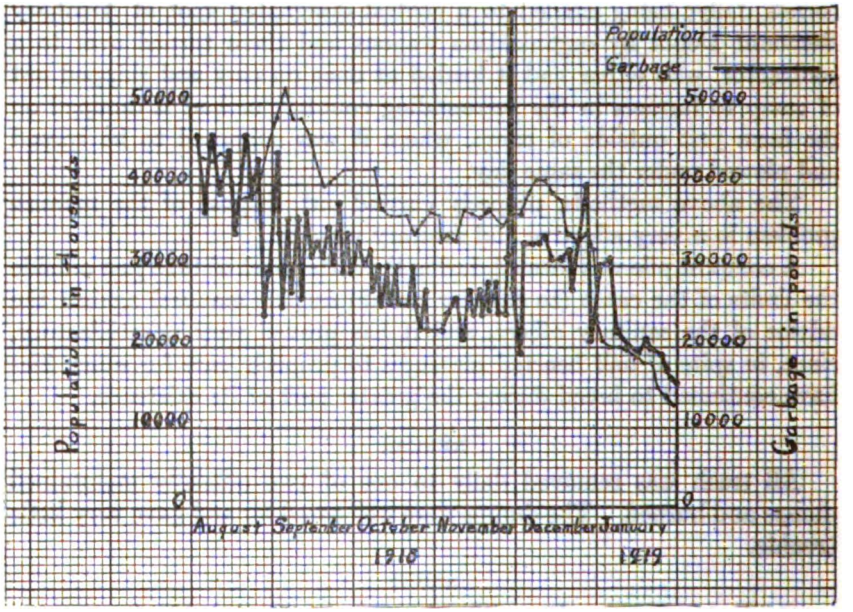
Dairies were regularly inspected by the camp veterinarian, also by inspectors from the local public health force, and many farmers, as a result, instituted improvements, some putting in pasteurizers.

Meats and other foods of a perishable nature were inspected daily by one of our veterinarians.

FOOD HANDLERS

In bakery, kitchens and messes, all those having to do in any way with handling of foods were regularly examined for carriers.

Since January 1, 1919, 502 food handlers were examined; of these 41 were positive for hookworm, while a few showed ascaris. No single case was positive for typhoid or para A or B.



All carriers discovered were removed from the detail having to do with handling of food until, after proper treatment, they were declared no longer dangerous.

SURFACE DRAINAGE

All areas in camp were drained by ordinary earth ditches, some of these being revetted, same emptying into large drains or mains, which in turn discharged into Gill's Creek.

Gill's Creek, a small stream, beginning some miles northeast of camp, flows along a tortuous course to the northern end of camp; then along the western boundary to the southern end, where it turns

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and, at a distance of some 9 miles, empties into the Congaree River a few miles below Columbia.

To properly care for surface drainage and sewage from the water-carriage system, Gill's Creek was dredged, at enormous expense by the Government, from Dent's Pond (located west and north of the camp) to the Congaree River, a distance of 8 or 9 miles.

The surface drains cared for all areas in the camp proper, also all swamps in and about the reservation. The swamps, being very extensive, were drained for the most part by means of one or more big main ditches with laterals at convenient intervals or wherever needed. As this section is highly malarial, it was essential that mosquitoes be kept at a minimum, the Anopheles varieties especially; consequently this drainage was necessary to eliminate, as far as possible, all breeding places.

Outside the camp proper, in the extra cantonment zone, work along similar lines was carried on by the United States Public Health Service, the work of the two services frequently overlapping, but all to a common end—the prevention of malaria.

In the period covered by this survey, some 20 miles of new ditches were constructed, while about 25,000 lineal feet of old ditches were cleaned each month.

COMMUNICABLE DISEASES

All cases of illness, whatever the nature, were sent to hospital, no quarters cases being allowed. This method is undoubtedly the ideal one, since an absolute check is maintained on all disease conditions, and the patient is in a position to receive better care than other wise would be the case; furthermore, greater accuracy is obtained as regards diagnosis, since at the infirmaries it is frequently impossible to properly diagnose disease conditions in the early stages.

After the patient was received at hospital and diagnosis made or confirmed, the organization surgeon responsible for sending the case was notified, usually by phone, and later frequently by letter. Where the case was in the class of transmissible diseases, steps were immediately taken to protect the rest of the command by quarantine of barracks or squad room. All contacts were searched for and isolated, appropriate measures being taken to care for contacts according to the nature of the disease.

The advantage of the small barrack as against the big type, or 150-man barrack, was clearly shown in the management of disease control. Where quarantine measures were instituted, the smaller groups involved, with the small or platoon type of barrack, interfered less with troop

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movements, drills and the like, and also made the work of the medical officer much easier in reaching contacts.

Where large groups of men were involved, as in the big barrack, proper quarantine measures were not easily maintained, since company commanders objected to the interference with daily routine duties, drills, etc.

Frequently troops under quarantine were transferred from one area of the camp to another without the knowledge or permission of any medical officer. And since undoubtedly conditions as above described will frequently be the case in the future, it not always being possible to obtain proper coöperation between the line and medical officers, the ideal barrack for our future army would appear to be the small type of building—the smaller the better, with kitchen and mess in separate structure.

Undoubtedly, in a big army, many lives could annually be saved and much illness prevented by the use of tents, since contacts here are at a minimum.

The principal diseases and total number of each, for year, were as follows.

Malaria	300
Pneumonias (lobar and broncho)	1,029
Measles	1,205
Mumps	1,428
Influenza	8,697
Veneral diseases	.....

Graph on following page shows morbidity rates for certain diseases duriug the year.

The rapid rise in pneumonia curve during September can be charged to the influenza epidemic.

MALARIA

The total number of cases disgnosed and treated at the hospital was 300. With one exception, none of these was charged against the camp, however, since careful epidemiological investigation proved them to be recurrent cases or new infections received prior to entering the camp.

Routine blood examinations of recruits entering the camp to rule out all possible carriers of malaria was undertaken, but, during the height of emergency, troop movements were so rapid and transfer of men and units so common that, as a result, only a small percentage were checked up. However, these measures, in addition to other anti-malarial work, practically ruled out all chance of new infections.

The Anopheles punctipennis, quadri meculatus and crucians are the common transmitters of malaria in this section, and it was only by

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ANTI-MOSQUITO WORK

What was once a typical swamp transformed by ditching into a beautiful park

GILL CREEK DRAINAGE CANAL

Dredged at enormous expense to care for certain wastes from camp

(To face page 375.)

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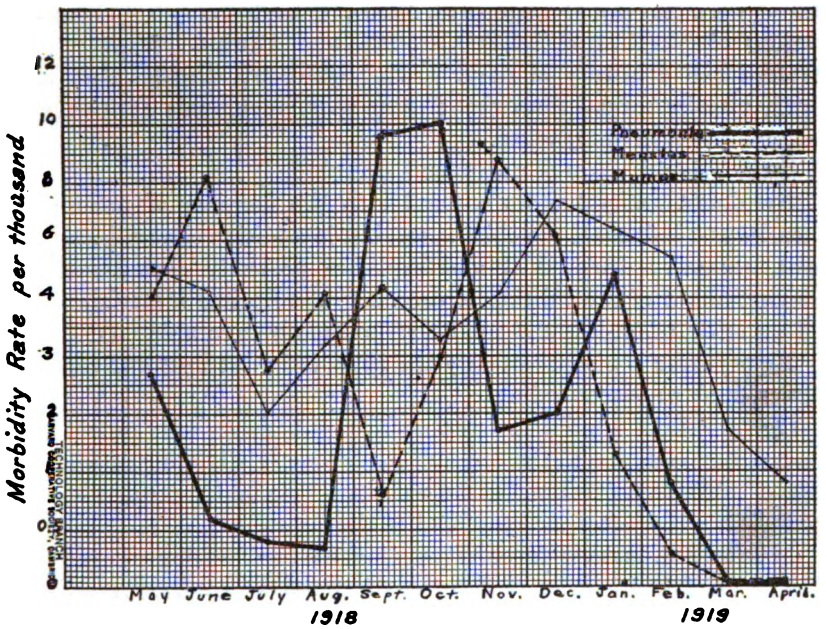
species of mosquitoes were practically eliminated from the camp and area immediately surrounding it.

The following table will give some idea as to findings in malarial investigation carried on during summer of 1918:



Month	Number of examinations for malaria	Number of cases positive	Tertian	Aestivo-autumnal EA	Quartan	Approximate number of men in camp
April.....	301	12	12	0	0	25,000
May.....	275	31	31	0	0	32,000
June.....	249	39	37	2	0	40,000
July.....	403	57	48	7	1	42,000

Total number of malaria examinations from May 1, 1918, to May 1, 1919...	5,277
Total number positive for malaria.....	300
Types of malaria determined:	
Tertian.....	203
Aestivo-autumnal.....	79
Quartan.....	13
Type not marked.....	1
Mixed (Aestivo-autumnal—Quartan.).....	1
Undetermined.....	2
Doubtful.....	1
Total.....	300

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PNEUMONIA

(Broncho and Lobar)

Total number of cases for year, 1,029.

A big percentage of cases were secondary to measles and influenza. During the summer and fall of 1918, recruits came to camp from the rural sections of North and South Carolina, and Florida. Most of this material had a history of never having children's diseases and, as a result, measles spread throughout camp with pneumonia appearing as a complication in many cases.

Some primary cases of pneumonia occurred.

No doubt many factors entered into the increase of pneumonia (measles and influenza, the chief ones), but in addition changed environment, excessive drills, dust and exposure probably encouraged the bringing about of a condition in especially susceptible material, where the organism at fault found conditions unusually favorable.

By exposure is meant not only the effect of undue heat and cold but factors, such as overcrowding.

Overcrowding applies to close contact outside as well as inside of the building and, due to the unusual conditions existing during the rush days of 1918, overcrowding was a condition constantly present and no doubt was a big factor in the spread of transmissible diseases.

Measles and mumps appeared in epidemic form during the year.

The chief factor encouraging the transmissible conditions appears to have been overcrowding, thus favoring contact with susceptible material.

Influenza became prevalent late in the year at the time of the general invasion of the country in September, with a total of some 9,000 cases charged to this camp. Pneumonia (broncho) proved the chief complication.

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HEALTH OF THE TROOPS IN THE UNITED STATES DURING 1918

By Major GEORGE A. SOPER
Sanitary Corps, United States Army

THE current statistics of disease for 1918 are now complete, and it is possible for the first time to review the records of the American troops in the United States during the whole calendar year.

This review sets forth facts of much interest, but the statement should be regarded as a preliminary and not a final one. The data which form the basis of it were not collected for the purpose of affording a final measure of the health of the troops, and they doubtless contain errors which make detailed conclusions unwarranted.

The statistics are based on estimates of the number of cases of disease and deaths by the officers in charge of the medical administration of each camp and military station from week to week. These estimates were prepared and sent to the Surgeon General in order to enable him to keep in touch with the state of health at the camps and take such action in relation thereto as he might think necessary.

The final statistics which will appear in the Annual Report of the Surgeon General of the Army will be made up from the personal records of each individual case of sickness. It is expected that they will be of much value, for the personal records possess a wealth of detailed information which the current statistics cannot be expected to contain. The compilation of the final statistics will delay the appearance of the final tabulations for some months. The interpretation of the figures will then consume a considerable period longer.

The value of the current statistics as now collected and tabulated by the Surgeon General lies largely in their immediate availability. They afford an opportunity for a rapid glance over the most essential features of the disease conditions. For this purpose the greater accuracy of the final statistics is not required, nor would their complexity of detail be of value.

The statistics of 1918 which are the subject of this review are based on the weekly telegraphic reports which have been received by the Section on Current Statistics of the Division of Sanitation of the Surgeon General's office at Washington. The statistics used for other years have been taken from the annual reports of the Surgeon General of the Army, Munson's Military Hygiene and the current reports of the United States Bureau of the Census and the United States Public Health Service.

Glancing over the whole subject of disease among the troops in

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the United States during the year 1918 in the light of the data here contained, the following facts stand out clearly. The large amount of sickness, which customarily occurs when large numbers of green troops are rapidly mobilized, has not been wholly avoided in this war. The intestinal diseases and malarial infections, which in former wars constituted so conspicuous a cause of disability and death, were practically eliminated. The sickness has been confined almost exclusively to the respiratory type of infections. A large part of the respiratory disease was connected with epidemics, of which the influenza outbreaks which occurred in the spring and early fall were the most conspicuous examples. It is probable that had it not been for the pandemic the death rate would have been little more than one-third of the rate recorded and the admission rate and non-effective rate would have been correspondingly smaller.

I. GENERAL ADMISSION RATES FOR 1918 AND OTHER YEARS COMPARED

The rate of admission to sick report, calculated as so many cases annually per 1,000 of strength, for diseases among all troops in the United States for 1918 was 1507.8. This figure is more than twice that for 1916 (747.6). The rate for 1898 during the epidemics of the Spanish-American War was 1,683.5.

During the period following 1898 there was a gradual decrease in the admission rate for all disease each year, until the low figure (620.1) of 1913 was reached. After that date the increase was slight until 1917 and 1918, when, under conditions of war, the rate became abnormal again.

It appears that an abnormal health situation existed from the malarial infections and intestinal diseases to which the American troops were exposed in and near the tropics as a consequence of the Spanish-American War and until 1913. This situation remained normal from 1913 until the beginning of mobilization in 1917 for the present war.

For a number of months preceding the increased prevalence of disease accompanying the Spanish-American War, the normal admission rate had been about 800 per 1,000 annually. The figure for 1913 was 620.1. The rate for 1916, just preceding the present abnormal prevalence of disease, was 747.6.

From these facts it seems justifiable to assume that the normal annual admission rate for American troops in camps during peace times in the United States lies somewhere between 620 and 800 per 1,000. The year 1916, then, may be considered a normal year. In comparison, the rate for 1917 was one and one-third times the normal, and that for 1918 was more than twice the normal.

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The influenza-pneumonia pandemic which occurred during September and October was the principal contributing factor to produce the high admission rate (1,823.9) which prevailed during the last three months of the year.

The rate for the final three months period of 1917, during which time no marked epidemics occurred, was 1,370.1. If 1917 could be considered a normal year under the existing war conditions, and the rate for October, November and December were transposed to the corresponding months of 1918, it would be possible to measure the effect of the pandemic in raising the admission rate during 1918.

Unfortunately, the rates were abnormal during the final quarter of 1917, due to the mobilization of the first draft, which began in September and proceeded with ever-increasing speed during the remainder of the year. The comparison has been made, however, and is given here for whatever value it may possess. The figures for 1917 are taken from the Report of the Surgeon General for that year; the figures for 1918 are from the current statistics.

ANNUAL ADMISSION RATES

Month	1917	1918
October	979.7	3,404.5
November	1,478.4	984.5
December	1,627.3	894.5
Average	1,370.1	1,823.9
Average for 1918 (including pandemic)		1,508.9
Average for 1918 (rates for October, November, December, 1917, substituted)		1,349.4

II. SEASONAL PREVALENCE OF DISEASE

Aside from the pandemic, the months of January, February, March and April saw the greatest prevalence of disease. The respiratory infections predominated during this season. During 1898, the months of greatest morbidity were August and September. The annual admission rates, based upon monthly admissions for 1898 and 1918, may be compared as follows. The figures for 1898 are from the annual Report of the Surgeon General, those for 1918 are based on the current statistics.

TABLE SHOWING MONTHLY ADMISSION RATES FOR ALL DISEASES AMONG ALL TROOPS IN THE UNITED STATES FOR THE YEARS 1898 AND 1918

Month	1898	1918	*Month*	1898	1918
January	817.3	1,687.1	July	1,801.8	1,069.6
February	716.2	1,699.7	August	3,055.3	1,024.3
March	789.0	1,542.2	September	3,261.5	1,501.3
April	781.4	1,662.8	October	2,405.8	3,404.5
May	970.8	1,148.6	November	2,232.7	1,172.7
June	819.0	1,055.9	December	2,551.6	894.5

Weather conditions may or may not constitute a factor in producing the diseases here considered. There is little doubt that different

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diseases have a seasonal prevalence. It is hard to conceive of any external influence other than weather that is common to all corresponding monthly periods of the years for which records are available, and which could be a factor in causing the regular annual seasonal occurrence of more or less severe outbreaks of certain epidemic diseases. And statistics show that such regular periodic outbreaks do occur.

Monthly records of cases of the special reportable diseases for the army were not included in the annual reports of the Surgeon General prior to 1900, and it is not possible to trace the seasonal occurrence of epidemics by information from that source. However, interesting compilations and summaries have been contained therein from time to time. A series of charts and tables, showing the average monthly rate of occurrence of certain diseases for the year 1884 and also for the preceding decade (1874 to 1883, nclusive), have been appended to the annual report dated October, 1885. The rates for three typical respiratory diseases, pneumonia, bronchitis and the catarrhal affections have been taken from the report and tabulated as follows:

Month	*Pneumonia Decade*	*Bronchitis Decade*	*Catarrh Decade*
January	8.3	90.1	242.4
February	7.2	72.9	166.5
March	8.2	70.2	187.9
April	5.3	50.6	143.7
May	3.3	36.5	99.5
June	2.5	22.6	61.7
July	1.9	19.9	46.4
August	1.9	22.0	51.9
September	2.1	27.3	76.4
October	3.3	40.9	93.7
November	4.5	62.1	136.1
December	4.7	73.8	192.8

January averaged highest of all of the months during the ten-year period. March came second. February was lower than January and March in pneumonia and catarrh.

It is possible that the statistics are wrong with respect to the February rates and that February is a more unhealthy month than the figures make it appear to be. The shortness of the month may produce a misleading rate. No explanation is given of the method used in computing the monthly rates. The rate for February would not be the same if the period were considered as 28/365th of a year, as it would be if considered one-twelfth of a year. February, being a short month, would have a relatively low rate if considered as the twelfth of a year. It would be more accurate to calculate the rate on the actual number of days in the month in each instance. In the absence of an explanation

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constant supervision with vigorous anti-mosquito work that the above of the methods involved in computing monthly rates, this chance of error must be considered. It is quite possible that February may be next to January as the month of greatest prevalence in pneumonia and catarrah as it is in bronchitis.

The five months of greatest prevalence of the disease for the decade mentioned (1874–1883) are, in order, as follows:

Order	*Pneumonia*	*Bronchiti*	*Catarrhus*
1	January	January	January
2	February	December	December
3	March	February	March
4	April	March	February
5	December	November	April

A compilation has been made of the cases of bronchitis, pneumonia and influenza in the Army for the period 1900 to 1913, inclusive. The so-called "catarrhus" which was mentioned in the earlier reports of the Surgeon General's Office was dropped in 1893 and influenza was placed upon the records in 1892. Inspection of this compilation shows that the January rates for bronchitis and pneumonia exceeded those for any other month. In the case of influenza, February was slightly in excess. During the fourteen years the high points have been distributed among the months as follows:

Influenza	*Bronchitis*	*Pneumonia*
January.....5 years	January.....7 years	January.....6 years
February.....6 years	March.....3 years	March.....3 years
March.....2 years	February.....2 years	February .....3 years
December.....1 year	December.....2 years	April..... 1 year
		September.....1 year

To measure the extent of seasonal influence upon the occurrence of these respiratory diseases it is well to study the relationship of the diseases one with the other. Let us assume that the kind of weather that commonly prevails in January is most conducive to the spread of certain diseases. In an early or belated winter the period of typical January weather may be moved forward or backward as the case may be. This, however, is not thought to be the most important reason for the delay of infections that commonly occur as sequelae to less serious respiratory affections.

Pneumonia should be given a prominent place in this class of diseases. In April, 1909, the annual peak of pneumonia was reached in the Army. There was no unusual prevalence of bronchitis and influenza during the same month, but rather severe epidemics of each occurred during February. Influenza, bronchitis and pneumonia all had their highest prevalence during January of the years 1901, 1911 and 1913. Influenza

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and bronchitis were both highest during January, 1908, and the peak of pneumonia followed in February of the same year. The high prevalence of pneumonia during January, 1913, was preceded by peaks of both influenza and bronchitis in December, 1912. The following table illustrates a possible relationship of influenza, bronchitis and pneumonia:

MONTHLY PEAKS OF INFLUENZA, BRONCHITIS AND PNEUMONIA

JANUARY			FEBRUARY			MARCH			DECEMBER		
Influenza	*Bronchitis*	*Pneumonia*	*Influenza*	*Bronchitis*	*Pneumonia*	*Influenza*	*Bronchitis*	*Pneumonia*	*Influenza*	*Bronchitis*	*Pneumonia*
1891	1901	1900	1903	1902	1904	1900	1906	1902	1912	1908	
1902	1902	1901	1904	1904	1908	1909	1909	1903		1912	
1908	1908	1905	1905		1910	1914	1910	1906			
1908	1907	1911	1906								
1911	1908	1912	1907								
1913	1911	1913	1910								
	1913										

Statistics for 47 large cities of the United States add to the evidence of the seasonal prevalence of the respiratory diseases. During the period of 1910 to 1916, inclusive, the month of greatest prevalence of the special diseases has been as follows: Influenza—January (33 cities); Bronchitis—January (20 cities); pneumonia—January (24 cities).

In summarizing the effect of weather upon disease, the following possible relationships may be noted: Inclement weather increases susceptibility to respiratory diseases in the already susceptible individual; it may cause some to become susceptible by lowering the physical resistance to disease generally; changeable weather is an indirect factor in the distribution of disease, since it affects the degree of crowding among people; inclement weather increases the virulence of certain epidemic diseases by increasing the distribution of the virus and increasing the susceptibility of the exposed persons; facility in distribution and greater susceptibility of those attacked tend to produce a more virulent strain as an epidemic disease develops. The writer does not advance these theories as his own: he merely mentions them as common beliefs which may or may not contribute to a better understanding of the observed data.

III. LOSS OF TIME FROM SICKNESS

The average non-effective rate for the year just ended was 47.1 per 1,000. This means that, on each day during the entire annual period, there was an average of more than 47 men of every 1,000 on sick report. They were either in hospital or quarters.

If this figure be multiplied by the number of days (365), and the product divided by 1,000, it will be found that the average time lost on account of sickness by each man in the Army in the United States was 18.07 days. This figure is nearly double that for 1917 when each man in service lost 9.19 days. Comparisons with other years have been

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tabulated as follows: 1896, 12.43 days per man; 1897, 13.08 days per man; 1916, 11.20 days per man; 1917, 9.19 days per man; 1918, 18.07 days per man.

This figure appears to be unusually high when compared with the time lost by the average working man of military age. No estimate has been found for the American working man, but Paget has given the following figures representing days lost by English working men "annually according to age": 20 years—4 days; 20 to 30 years—5 to 6 days; 45 years—7 days.

The proportion of days of sickness to death among troops in the United States Army has been estimated by Billings to be 3,867 to 1; in civil life, 730 to 1. During 1918, the proportion for the Army was 761 to 1. The great variation between the figures for the Army and that for civil life as estimated by Billings is largely due to the fact that only comparatively severe cases of sickness among civilians receive the attention of physicians and are reported, while, in the Army, men are ordered on sick report for the slightest disability, and each case is brought to the attention of the organization surgeon.

During 1918 the proportion for the Army was only slightly greater than that for civil life. This was due to the large number of deaths with short periods of sickness which occurred in the influenza-pneumonia pandemic.

IV. THE MORTALITY RATE

The death rate from all causes, during 1918, has been nearly four times greater than that recorded for 1917 and nearly five times that for 1916. The rate for "disease only" has been correspondingly high. The death rates for 1918 and other years, compared, is as follows:

Year	*All causes*	*Disease only*
1918	24.4	21.23
1917	6.3	5.3
1916	5.2	5.1

During the period September 1 to December 31, 1917, in an average strength of approximately 1,000,000 troops, 2,047 deaths occurred from all causes. Had the strength been as great as the average for 1918 (1,300,000), the same death rate would have caused 2,661 deaths.

There was a total of 23,615 deaths reported during the last four months of 1918. A fair approximation of the excess deaths during 1918, and caused by the pandemic, is 21,000. Without the occurrence of the pandemic, it is estimated that about 9,200 deaths would have been recorded during the year. The annual death rate would then have been 7.1. This would have been a little more than one-third the rate which occurred for the year (20.3).

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During the year there were reported by daily and weekly telegram a total of 30,163 deaths from all causes among troops in the United States. This figure, large as it appears, is thought to be very conservative.

The annual death rate recorded by the Census Bureau for 47 large cities of the United States, during 1918, was 19.6. The rate for the camps seems high in comparison with the rates for cities when it is considered that the extremes in the age scale and the physically weak are almost entirely eliminated from the Army, and at the same time left to swell the sick and death rates of the civilian population. The comparison is still more unfavorable to the camps when it is considered that the deaths under one year of age comprise 12.5 per cent of all deaths reported by the cities.

The highest annual death rate for any city was 26.8; this was reported by Baltimore. The rate reported by Baltimore for 1917 was 18.9. Nashville was a close second, with a rate of 26.4 per thousand. The following table gives a comparison of seven of the highest rates in the cities and in the camps for the year 1918:

City	*Death rate*	*Camp*	*Death rate*
Baltimore	26.8	Sherman	39.1
Nashville	26.4	Dodge	38.6
New Orleans	25.9	Beauregard	38.3
Pittsburgh	25.4	Grant	36.1
Philadelphia	24.2	Dix	29.7
Rochester	23.6	Hancock	29.6
Washington, D. C.	23.6	Taylor	28.2

In the cities, as in the camps, the death rates for 1918 were higher than for the preceding year. During the three-months period of the influenza-pneumonia pandemic, as many deaths resulted in the cities as would have occurred from all of the respiratory diseases together during a period of 18 months if the average rate of former years had prevailed.

V. THE PRINCIPAL CAUSES OF DEATH

Pneumonia was the principal cause of death by disease in the Army in America. It accounted for 24,538 deaths, or 81.4 per cent of all deaths that occurred among the troops in the United States during the year. A larger part of it was due to the influenza pandemic.

Influenza was the second most frequent cause of death, according to the returns. There were 1,133 deaths attributed to influenza.

Of the other diseases causing death, meningitis, to which 883 deaths have been accredited, stands third. The following tabulation gives the prevailing causes of death as recorded during 1918:

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Disease	*Total deaths*	*Disease*	*Total deaths*
Pneumonia	24,538	Scarlet fever	69
Influenza	1,133	Typhoid fever	42
Meningitis	883	Dysentery	10
Tuberculosis	383	Other diseases	1,486
Empyema	308	External causes	1,033
Septicemia	112	Suicide	90
Measles	76		
		Total	30,163

Meningitis had the highest case fatality of any infectious disease that occurred among the troops in the United States during 1918. Of all the cases of meningitis reported during the year, 42.1 per cent resulted in death.

Pneumonia was a very fatal disease; 35 of every 100 attacked died. In typhoid, 10 per cent of all cases were fatal.

The following table shows the admission rates, death rates, and present case fatality of the most important epidemic diseases in 1918:

Disease	*Admission rate*	*Death rate*	*Per cent deaths*
Meningitis	1.59	0.67	42.1
Pneumonia	53.49	18.80	35.1
Typhoid	0.30	0.03	10.0
Dysentery	0.56	0.007	1.3
Scarlet fever	5.23	0.054	01.03
Measles	34.05	0.57	0.17

The rates represented in this table are mathematically correct, but they should be accepted with reservation as indicators of the relationship of the special diseases to one another and in their bearing upon the general health situation.

For example, in the consideration of measles, it might seem fair to infer from the foregoing table that measles was not a very important disease of those least fatal. To suppose this to be the fact would be to commit a grave error. Measles has been one of the most serious diseases that have affected our troops. During 1917, 47,573 cases of measles were reported among the troops in the United States. Nearly 10 per cent of all cases of disease reported during the year were diagnosed as measles. There were 3,415 complicated cases divided as follows:

Disease	*Cases*
Measles and broncho-pneumonia	1,372
Measles and lobar-pneumonia	703
Measles and other complications	1,340

There were performed, during 1917, 199 surgical operations in measles with complications; 41 of these surgical patients died; 27 received disability discharge on account of complications attributed to measles.

During 1917 there were recorded 947 deaths from measles, both complicated and uncomplicated cases. This figure represents 31.7 per cent of all deaths from disease that occurred:

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Deaths from Measles, 1917

	Deaths	*Rates*
Total complicated	927	1.66
Total uncomplicated	20	0.04
Complications		
Broncho-pneumonia	622	1.11
Lobar-pneumonia	266	0.48
All others	39	0.07

The admission rate for measles, including complicated cases, during 1917 was 85.15, the death rate was 1.7, and the case fatality was 1.9 per cent. The case fatality for complicated cases alone was 36.2 per cent. Correspondingly high rates for 1918 would give measles much prominence among the important causes of disability and death.

There are other reasons why it is not advisable to adhere too closely to the bare statistical evidence in making deductions. Admission and death rates for many diseases are too high as compared with the rates for all diseases and the special diseases, because when a man on sick report develops two or more different diseases no allowance is made for this fact in the records of current statistics. A typical case will serve to illustrate this point. A patient is admitted to hospital for scarlet fever and reported as such. After ten days he contracts measles, and is then taken up as another admission, this time for measles. Finally, pneumonia develops and the admission is recorded for a third time. If at last the patient dies, pneumonia being the immediate cause of death, pneumonia is given as the cause of death in the telegraphic reports, while the contributory causes, scarlet fever and measles, are disregarded. As a result of this course the admission rates for scarlet fever, measles and pneumonia are too high, and the pneumonia death rate is raised. The disproportionate increase of the admission rates of mumps and measles over the death rates for the same tends to increase their case fatality and reduce them unjustly to the plane of relative unimportance that they now hold in the scale of communicable diseases.

Next in importance to the loss of the lives of troops by disease is the loss of time on account of disability produced by disease. While measles, mumps, bronchitis, influenza and so-called minor affections have not figured prominently in the category of fatal diseases, they have been found to be the chief factor in sustaining a high, non-effective rate. The camps have rarely, if ever, been entirely free from scattered cases of these infections. They especially attack the new men. The mobilization of recruits in a camp can be effectively traced by the successive waves of mumps and measles which occur.

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The following table has been prepared to show the principal diseases causing disability among troops in the United States during 1917. The aggregate of all days lost by each soldier during the year is given:

Disease	*Man-days lost*	*Disease*	*Man-days lost*
Measles	536,400	Disease of tonsils	217,249
Gonococcus infection	454,703	Syphilis	175,816
Mumps	254,523	Pneumonia	174,505
Bronchitis	229,199	Influenza	133,297

While the final records are not yet available for 1918, it may well be assumed that the non-effective rate for these minor epidemic diseases will be found to be as high in 1918 as it was in 1917. The current statistics indicate that the admission rates will correspond with and, in some instances, possibly exceed those of the preceding year.

VI. THE PREVALENCE OF THE RESPIRATORY INFECTIONS DURING 1918

It is impossible to estimate accurately the prevalence of respiratory diseases and infections in the Army during the annual period of 1918. The weekly and daily telegraphic reports which serve as the basis of the current statistics did not include influenza or bronchitis until the outbreak of the pandemic in September. No reports were made of mumps. The wave of influenza which swept the camps in the spring was not generally reported.

Nevertheless, the increases in the general admission rate during the winter of 1918, and again during March and April, are significant of the presence of influenza. Reports rendered by camp surgeons, camp epidemiologists and inspectors from the Surgeon General's Office repeatedly mentioned an unusual prevalence of influenza, bronchitis, bad colds, grippe, rhinitis, etc., during the winter and spring periods. As a further evidence of the presence of influenza, the pneumonia rates were unusually high during March and April.

On April 17, 1918, a report was submitted by the present writer to the Surgeon General from Fort Oglethorpe, Georgia, on an investigation of an explosive epidemic of influenza. The distribution of the disease, rapid spread, incubation period, initial symptoms, diagnosis, and predisposing housing and weather conditions were discussed. There was later reported from Camp Sevier an epidemic which spread with lightning-like rapidity over many organizations. The symptomatology was like that reported from Oglethorpe. A few cases of post-influenza pneumonia occurred in each instance.

At least ten camps reported outbreaks at this time. An increased prevalence of pneumonia as a complication was mentioned in most of them. Whether from the presence of influenza or not, the prevalence of pneumonia in the army as a whole increased at this time. The

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following table shows the camps which reported an unusually high incidence of influenza and other respiratory infections during the spring of 1918, and the months during which such conditions existed:

Camp or station	*Month*	*Camp or station*	*Month*
Oglethorpe	March	MacArthur	March
Sevier	March	Sheridan	April
Newport News	March	Shelby	April
Bowie	March	Custer	April
Cody	March	Fort Riley	June

Of much interest in connection with the influenza wave which occurred in the spring of 1918 is the location of the camps where influenza was reported. All of the camps reporting epidemics during March and April were located in the southeastern group of states and in Texas, with the single exception of Camp Custer, Michigan.

The epidemic of undetermined disease which occurred at Fort Riley, Kansas, as described in a report dated June 4, 1918, bore a strong resemblance to the epidemic of influenza that occurred throughout the United States in September and October. The writer of that report states that nasopharyngitis, tonsillitis and bronchitis with much coughing and expectoration (graveyard cough) were very prevalent. The acute attack resembled the "so-called respiratory form of grippe." The onset was often exceedingly sudden, usually without chill, followed by high fever and prostration out of proportion to the amount of physical evidence of infection. Nearly every newcomer developed an attack.

All of the pneumonia which occurred in 1918 was not, of course, attributable to influenza. During July and August the rate for the troops in the United States was above the normal for the summer season. The rates in the following camps were especially high: Cody, Pike, Travis, Taylor, Gordon, Sevier, and Newport News.

In some distant stations outside of the United States, influenza outbreaks occurred during midsummer. Reports covering influenza during the summer were received from the camps and stations of the Panama Canal Zone. Cases occurred at Camp E. S. Otis, during May, steadily increasing toward the end of the month. A rather severe epidemic occurred early in July. The peak (140 daily admissions) was reached on July 5. Scattered cases were reported during August, but no increase occurred in September. An increased rate of influenza during June and July was recorded in the camp at Empire, C. Z. Fort Sherman, C. Z., reported a mild epidemic during August and September.

The great influenza-pneumonia pandemic which swept the world in 1918 invaded the army camps of the United States chiefly during

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September and October. In the opinion of many, the infection of the early fall was a recurrence of the wave that had prevailed during the spring. Others believed that the pandemic was the result of the introduction of an entirely new strain of the virus. Reports show that nearly 25,000, or about 30 per 1,000 of all troops in the United States, died of influenza and pneumonia during the last four months of the year.

Coincident with the pandemic in the camps, the civilian population throughout the country was attacked by the influenzal infection. While complete records of cases are not yet available, and probably never will be, the progress of the epidemics in 47 of the large cities has been statistically shown by a weekly "Health Index" issued by the Bureau of the Census. Only deaths have been included in the report. It has consequently been necessary to use death rates as an indicator of the incidence of the disease.

The epidemics of cities and camps in the same section of the country have generally reached their peaks within the same week. A summary of the data contained in the weekly "Health Index" was issued by the Census Bureau, covering the period of the pandemic, September 14 to November 30, inclusive. The death rates for the camps have exceeded those for the cities shown in the following table. This table compares the highest cities with the highest camps:

Cities	*Death rates*	*Camps*	*Death rates*
Philadelphia	7.6	Lee	42.4
Pittsburgh	7.6	Cody	34.1
New Orleans	6.8	Sherman	33.6
Syracuse	6.6	Grant	31.4
Baltimore	6.5	Beauregard	31.3
Boston	6.2	Dodge	25.3
Nashville	6.1	Dix	24.6

It has been possible thus far to make estimates which are only rough approximations of the total number of deaths in the United States attributable to influenza and pneumonia during the pandemic. The U. S. Public Health Service has made a conservative estimate that the deaths due to the pandemic in the United States was about 350,000. The New York Life Insurance Company has placed the number at 460,000. It is doubtful if this larger estimate is great enough.

VII. TROOP MOVEMENTS AND THE SPREAD OF DISEASE

It is to the recruiting of the Army and the movement of troops from one point to another that the high rates of disease are mainly attributable. The chief means by which the virus and the suceptible person are brought together is contact. The more frequent and more intimate the association, the greater the chances of infection. The movement of troops increases the range of contact among soldiers, thereby lessening

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the possibility of those not immune to escape the disease. It is quite certain that if the soldiers in a camp were to remain for a period of a few months without accessions of new ones, the sick rates would reach a normal, and that this normal would be lower than that existing in the civilian population.

The constant influx of recruits into the camp and the numerous transfers of large and small detachments from one station to another, followed by the successive steps en route to the front, have all assisted in elevating the morbidity, non-effective, and mortality rates during the period of the war.

VIII. THE CRITICAL PERIOD FOR THE RECRUIT

The first three months a man spends in a military camp may be called his critical period. New experiences follow each other in rapid succession during this time. There is reason to believe that his unaccustomed environment makes him especially exposed to disease.

The drafted man is summoned by his local board and transported to to the nearest camp in company with many others. These men soon find that they have much in common. They feel that they are all embarking upon a great adventure. In face of the uncertainty of the future there develops a disregard for ideals and standards of living which had been of foremost consequence to them.

The men arrive in camp exhausted. They are assembled in a detention area with thousands of others. They submit to the unfamiliar rules of discipline and are listless and careless in their association with each other. There are long periods of standing in line for the physical examination and the issue of clothing and equipment. At night they remain in the prescribed area, where they are usually to be found packed into a Y. M. C. A. hut.

After the first week of detention, a temporary organization of the recruits for drill and instruction is usually made. The hours on duty and the extent of work assigned are regulated by the commanding officer of the camp. It seems unavoidable, either through lack of proper personal precaution, inclement weather, or for other reasons that the men should become overheated, chilled, neglectful of removing wet clothing and shoes; be permitted to sleep without proper ventilation, or with insufficient bedding; or in many other ways be subjected to unaccustomed exposure.

Finally, when the men are assigned to permanent organizations, hours of duty become longer and drill grows heavier. The climax of the critical period is now reached. During the time of detention, the men who through natural or acquired immunity were not suscepti-

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ble to the common epidemic affections were reasonably safe. Now it is a question of constitutional vitality. The fit survive and are able, through muscular exercise, wholesome food, and regular hours, to build up a resistance against exposure and exhaustion.

IX. MOBILIZATION AND DISEASE IN 1917

The Army increased in strength from 217,272 in January, 1917, to 1,538,203 in December of the same year.

The steps in the mobilization of the Army can be traced by the curve of admission of the common epidemic diseases and more especially by the rise and fall of the venereal rate. Most cases of the latter, however, were contracted prior to enlistment or induction and were discovered during the careful physical examination which the men passed through upon entrance to the service. The following table shows the monthly incidence of cases of the five most prevalent communicable diseases:

Month, 1917	*Measles*	*Pneumonia*	*Mumps*	*German measles*	*Venereal diseases*
January	632	265	331	33	1,112
February	1,195	233	376	144	923
March	817	252	350	181	762
April	764	223	495	166	1,276
May	1,472	210	638	362	1,566
June	1,561	139	775	425	2,181
July	1,007	121	765	289	3,112
August	678	163	585	191	4,706
September	998	290	746	328	11,129
October	4,447	1,015	1,713	367	15,815
November	21,717	2,443	4,257	2,163	12,402
December	12,285	3,078	10,694	4,333	8,937
Total	47,573	8,432	21,725	8,982	63,557

The largest increment of recruits occurred in September. The greatest prevalence of measles was reported in November. Pneumonia, mumps and German measles reached their peak in December. It is not likely that severe epidemics of these infections would occur in a body of recruits during the first month. If it be assumed that all other conditions incident to the outbreak and spread of these diseases remained constant during the period, two months has been the minimum period for the development of greatest momentum according to the above statistics. About one-fourth of all pneumonia cases have occurred as complications of measles, which partially accounts for the fact that the period of high prevalence of pneumonia should follow that of measles. Weather conditions and a longer incubation period may have caused the delay in mumps.

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A more intimate study of the different camps indicates the same relationship between influx of recruits and the epidemic situation. At Camp Lee, 18,721 recruits were received during the period September 19 to 24, inclusive. Admission for measles increased from one case in October to 206 in November. Mumps jumped from 7 to 276 admissions during the same period and reached 990 during December. The following statistical comparison has been made of strength and disease at Camp Lee:

	Sept. 5–10	Sept. 19–24	Oct. 3–8	Oct. 27–31	Nov.	Dec.
Increment	2,340	18,721	9,478	9,050		
Disease:						
Measles	3		1		206	218
Mumps	1		7		276	990
German measles	..		..		10	249
Pneumonia	2		1		17	49

The situation at Camp Lee is typical of all National Army camps. There was, however, a marked variation in the severity of the epidemics in the different camps. The relative immunity of the men composing the different commands was probably responsible for this variation. It has been observed that camps suffering least from the measles and mumps were those which received men from the more densely populated areas. In the following table the camps have been grouped according to the areas represented by their personnel. Almost without exception the rural camps have shown higher rates for measles and mumps.

Urban		*Rural*	
Upton	Custer	Taylor	Greene
Devens	Lee	Jackson	Beauregard
Meade	Sheridan	Dodge	Doniphan
Grant	Shelby	Funston	Bowie
Dix	MacArthur	Gordon	Cody
Sherman	Wadsworth	Travis	Sevier
		Lewis	Kearney

X. TROOP MOVEMENT FROM CAMP TO CAMP

Inter-camp troop movements have been mentioned as a means of increasing a soldier's circle of contact with others, and, in so doing, assist in the distribution of infection.

During the period intervening between the first cases at Devens and the period when the quarantine measures became effective, detachments were sent from Devens to Camps Taylor and Grant. It is significant that Grant was the first middle-western camp to report epidemic conditions. It was reported from Camp Taylor that men transferred from Devens to the Central Officers' Training Camp were probably responsible for the first cases of influenza there.

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Camps Grant and Taylor both repeated the mistake made by Camp Devens by sending out several detachments to other camps before the situation was recognized as dangerous. Camp Taylor appears to have infected Camp Kearney, and Camp Hancock, Bowie and MacArthur trace their epidemics from the arrival of the infection with men transferred from Camp Grant.

Other instances of the spread of infection by the movement of troops from camp to camp could be cited, but the fact is so evident that further proof would appear to be unnecessary.

XI. HEALTH CONDITIONS IN THE TENT AND BARRACK CAMPS COMPARED

The cantonments provided in the United States for the preliminary training of troops may be divided into two general groups; those consisting largely of tents and those in which the men were housed in frame barracks. Most of the former group were located in the southern states and were used originally for the training of the federalized National Guard troops. The latter group were generally distributed throughout the country and were used almost exclusively for the training of troops mobilized by the selective draft.

In the following calculations there have been selected fifteen of the typical tent camps and eighteen of the more permanently constructed barrack cantonments, in order to compare one group with the other.

	Tents	*Barracks*
Admission late.....	1,408.1	1,616.8
Death date.....	17.1	23.88

The admission rate for the barrack camps was in excess of the corresponding rate for all troops in the United States (1,508.9), while that given for the tent camps was considerably less. The same difference may be noted to a still greater degree when the death rates are compared in like manner. The rate for all troops as previously stated in the review was 20.3.

The highest admission rate recorded in any tent camp was 1,908.2 at Beauregard, while Pike, the highest of the barrack camps, reached 2,979.9. The highest death rate in the latter group (39.08 at Sherman) exceeded that reported by Beauregard (38.26) which stood first among the tent camps.

XII. THE SPECIAL DISEASES IN TENT AND BARRACK CAMPS

It has been noted that the barrack camps had the greater prevalence of respiratory disease and the lesser amount of disease affecting the digestive tract. It is thought by some that the location of the camps and the geographical origin of the personnel may have been largely

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responsible for these differences. Others are inclined to believe that greater congestion in the barrack camps contributed to the greater prevalence of the respiratory infections. The part played by the intestinal diseases in raising morbidity and mortality rates in the tent camps, where they figured more prominently, is a negligible factor, and makes their further consideration unimportant.

Seven camps of the barracks group (Custer, Travis, Meade, Dodge, Taylor, Funston, Devens) had higher admission rates for pneumonia than Cody (81.43), the highest of the tent camps.

The relative prevalence of influenza and pneumonia in the tent and barrack camps during the pandemic has been discussed in detail in the monthly reviews that were written during the progress of the pandemic. The following comparative rates were contained in the report covering the pandemic from the outbreak up to November 1:

	Tent	*Barracks*
Influenza cases	69,761	158,104
Pneumonia cases	9,740	30,099
Total deaths	2,923	10,535
Per cent having influenza	22.2	21.5
Per cent influenza having pneumonia	13.9	19.0
Case fatality of pneumonia	30.1	35.0

The statistical evidence seems to indicate that the respiratory infections in general found fewer susceptibles in the tent camps. Various explanations have been attempted. It is probable that a combination of causes exists.

XIII. COMPARISON OF THE HEALTH OF TROOPS IN DIFFERENT CAMPS

It is not considered to be practicable in a brief review of the general health conditions, to make a detailed study of each camp. However, extreme situations deserve to be mentioned here. In the following tabulation the ten camps leading in admissions and deaths from disease have been arranged in order:

Order of rates	*Admissions*	*Deaths*	*Order of rates*	*Admissions*	*Deaths*
1	Pike	Sherman	6	Travis	Hancock
2	Upton	Dodge	7	Logan	Custer
3	Gordon	Beauregard	8	MacArthur	Taylor
4	Las Casas	Grant	9	Lewis	Funston
5	Beauregard	Dix	10	Taylor	Meade

Pike had the highest admission rate for the year. Pike is a barrack camp located at Little Rock, Ark., and was used for the training of drafted men from Arkansas, Louisiana, Mississippi and western Alabama

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The average strength of command during 1918 was 36,280. The annual admission rates for each of the special diseases exceeded the average for all troops. The measles rate for the year was nearly three times greater than the average for all troops, and only two camps were higher. Pike stood ninth on the list of camps arranged according to the prevalence of influenza during the pandemic.

Sherman had the highest death rate of any camp. Sherman is located at Chillicothe, Ohio, and the average strength of 32,460, during the year, was made up largely of drafted men from Ohio and Pennsylvania. The per cent case fatality of pneumonia and influenza was higher at Sherman than in any other camp during the pandemic.

Beauregard and Taylor are the only camps to appear among the highest ten, both in admissions and in deaths. Each of these camps has exceeded the average admission rate for every one of the special reportable diseases and have had more than the average amount of undefined disease on the telegraphic reports.

XIV. THE PREVALENCE OF THE SPECIAL DISEASES IN THE CAMPS

The following table has been prepared for the consideration of the special reportable diseases as they occurred in the different camps; the ten camps having the highest incidence have been arranged in order under each disease:

Order of rates	*Pneumonia*	*Meningitis*	*Measles*	*Typhoid*	*Dysentery*	*Malaria*
1	Custer	Beauregard	Las Casas	Bowie	Hoboken	Beauregard
2	Travis	Jackson	Gordon	Las	Newport News	Pike
3	Hoboken	Taylor	Pike	Newport News	Beauregard	Shelby
4	Meade	Greene	Funston	Sevier	Travis	Sevier
5	Taylor	Gordon	Dodge	Dix	Shelby	Las Casas
6	Dodge	Pike	Taylor	Travis	Wheeler	Johnston
7	Devens	Funston	Jackson	Gordon	Bowie	Wheeler
8	Funston	Travis	Johnston	Wadsworth	Fremont	Newport News
9	Cody	Johnston	Hoboken	Jackson	Dix	Travis
10	Lewis	Sevier	Sheridan	Pike	Greene	Logan

The camps which stand out most prominently in all of these lists are Hoboken, Taylor, Funston, Travis, Beauregard, Jackson and Newport News. Each camp appears on three or more of the lists. No camp of the southeastern group was on the list of the first ten pneumonias. Under meningitis, six of the first ten were in this group. Hoboken was the exception under measles, all of the other camps with high rates being located in the south and middle west. The typhoid and malaria lists included only camps in the southeastern and southwestern sections with the single exception of Las Casas, which was fifth in the incidence of malaria.

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Camps	*All Dysentery*	*Pneumonia*	*Meningitis*	*Measles*	*Typhoid*	*Dysentery*	*Malaria*	*Deaths*
Beauregard.....	1908.2	74.35	6.52	22.11	0.26	4.36	28.62	88.26
Bowie.....	1673.3	39.92	1.14	9.72	1.24	0.78	3.45	11.46
Cody.....	877.6	81.43	1.56	23.88	0.16	0.17	3.86	21.32
Greene.....	1676.2*	64.36	2.81	21.93	0.17	0.52	4.62	24.24
Fremont.....	1012.1	48.32	0.72	36.56	0.21	0.63	1.09	13.39
Hancock.....	1075.3	48.23	1.18	18.97	0.09	0.03	1.44	29.63
Kearney.....	1196.6	44.25	0.55	19.26	0	0	1.42	11.24
Logan.....	1800.9	38.14	0.84	35.42	0.22	0.33	5.98	89.0
MacArthur.....	1756.3*	46.32	0.49	30.47	0.19	0.33	1.31	17.25
McClellan.....	1338.2	66.19	1.06	35.03	0.35	0.04	3.42	14.62
Sevier.....	1310.9	48.39	1.84	30.93	0.51	0.09	3.82	19.82
Shelby.....	1534.9	22.38	0.89	24.26	0.37	2.04	11.96	7.66
Sheridan.....	1368.3	47.91	0.34	35.68	0.09	0.14	2.17	11.16
Wadsworth.....	1035.9	43.82	0.87	14.42	0.40	0	1.64	10.58
Wheeler.....	1491.5	68.14	1.23	0.91	0	0.92	6.41	17.38
Custer.....	1187.8	103.26	0.68	20.24	0.14	0.05	2.25	28.42
Devens.....	1343.2	86.41	1.43	29.82	0.19	0.02	4.26	24.99
Dix.....	1449.8	59.32	1.21	18.42	0.51	0.59	1.82	29.72
Dodge.....	1506.8	88.23	1.14	72.41	0.09	0.03	0.86	38.62
Funston.....	1585.2	82.14	2.05	73.22	0.05	0.05	0.59	26.56
Gordon.....	2008.5	43.19	2.43	85.54	0.43	0	4.67	13.82
Grant.....	898.1	40.26	0.73	34.82	0	0.02	0.68	36.14
Jackson.....	1000.0	49.39	6.43	53.45	0.38	0.34	2.45	19.35
Johnston.....	1334.9	38.21	1.86	46.25	0.34	0.05	6.46	11.72
Las Casas.....	2004.8*	52.83	0.00	92.48	0	0	7.86	17.46
Lee.....	1403.2	52.21	1.24	36.21	0.68	0.41	0.81	22.23
Lewis.....	1733.7*	75.29	1.09	28.42	0.05	0.08	1.01	9.43
Meade.....	1021.5	98.76	1.83	21.94	0.13	0.13	1.18	26.42
Pike.....	2979.9	67.21	2.26	82.14	0.38	0.38	12.43	23.82
Sherman.....	1571.3	65.41	0.89	26.44	0.15	0.06	0.71	39.08
Taylor.....	1718.7	90.64	2.83	63.14	0.12	0	0	28.21
Travis.....	1831.2	100.42	1.91	19.83	0.50	2.45	5.86	16.28
Upton.....	2534.3	42.18	0.78	10.86	0.08	0.09	2.48	17.52
Hoboken.....	.....	105.82	1.64	43.35	0.05	6.06	2.59	26.97
Newport News..	.....	50.18	1.23	27.76	0.62	4.82	6.06	17.82
Syracuse.....	.....	182.28*	0	12.5	0	0	0	78.91*
Forrest.....	2046.8*	49.38*	0	12.36	0	0	0	53.57
Greenleaf.....	1393.0*	67.88	0.88	42.00	0	0.48	1.89	19.81
Humphreys.....	1469.8*	72.86	0.56	14.85	0.03	0.32	0.63	59.09*
Eustis.....	1454.9*	34.82	0	21.81	0	0.36	4.12	38.81*

* For period of six months ending December 27, 1918, only.

XV. DISEASES IN THE EXPEDITIONARY FORCE IN FRANCE

The current statistics relative to the health of troops overseas during 1918 are inadequate for thorough study and comparison, yet inasmuch as the annual rates for the special diseases were carried each week in the consolidated report of the Section of Current Statistics, some notion of the diseases in the expeditionary force in France will be given here.

The average annual rates for 1918 for six of the reportable diseases have been compared with those given for troops in the United States as follows:

ANNUAL RATES OF SPECIAL DISEASES, 1918

Disease	*U. S.*	*France*
Meningitis.....	1.59	2.42
Pneumonia.....	53.49	26.48
Typhoid.....	0.30	0.29
Dysentery.....	0.56	2.24
Scarlet fever.....	5.23	5.79
Measles.....	34.05	11.01

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Meningitis, dysentery and scarlet fever were more prevalent in France, while rates for pneumonia, measles and typhoid were in excess in the United States. The highest weekly rate for pneumonia was reached on October 11 by troops in the United States: 591.5. In France, the rate for the week ended October 17 (106.7) was highest for the year. The winter prevalence reached its peak in the United States, January 18; in France, January 11. Spring epidemics of pneumonia preceded by an unusually high prevalence of the milder respiratory affections occurred among all troops both at home and in France. Meningitis was highest in the Expeditionary Force in February and and October; scarlet fever occurred in epidemic waves in January and March; dysentery reached a peak in August and remained high during the balance of the year.

The permanent statistical records for 1917, as contained in the Surgeon General's Annual Report, have been used in the further study of health conditions in the United States and France. Admissions, non-effective and death rates for all disease and for thirteen of the most important communicable diseases have been tabulated as follows:

DISEASE RATES FOR AMERICAN TROOPS IN THE UNITED STATES AND FRANCE FOR 1917

	Admission		*Non-effective*		*Death*	
	U. S.	*France*	*U. S.*	*France*	*U. S.*	*France*
All disease	886.8	744.2	21.79	22.21	5.34	3.00
Bronchitis	61.75	129.83	1.12	2.25	0.01	....
Pneumonia	15.18	11.81	0.85	0.55	1.71	1.18
Pleurisy	9.43	7.64	1.7	2.2	0.02	0.04
Measles	85.15	28.83	2.63	0.76	1.70	0.39
Measles and pneumonia	3.72	0.52	0.25	0.03	1.59	0.39
Influenza	57.72	101.16	0.69	1.28	0.01	0.04
Typhoid	0.41	0.20	0.05	0.01	0.03	....
Malaria	7.46	2.43	0.15	0.05	0.01	....
Smallpox	0.26	....	0.01	....	....	....
Scarlet fever	3.52	3.66	0.22	0.17	0.09	0.18
Dysentery	0.87	0.90	0.05	0.04	0.01	0.02
Meningitis	1.74	1.45	0.11	0.08	0.54	0.42
Mumps	38.89	82.08	1.25	2.46	0.01	0.02

The general admission and death rates were higher among troops in the United States, while the non-effective rate for disease averaged slightly higher in France. In considering the low death rate in France as compared with the United States, it must be remembered that the men sent overseas were the physically select of all those mobilized in the camps at home. Furthermore, the men, in most instances, passed through the acclimatization period while training in the United States and were often seasoned soldiers before being attached to the Expeditionary Force.

Pneumonia was more prevalent among troops in the United States,

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but the case fatality in France exceeded that indicated for all American troops in France and the United States combined:

	U. S.	*France*	*All troops*
Admission rate of pneumonia.....	15.18	11.81	14.59
Case fatality for pneumonia.....	.....	17.10	15.76

The admission and death rates for the following diseases were higher in France: Bronchitis, influenza, mumps, scarlet fever and dysentery.

The last two named were only slightly in excess, but bronchitis, influenza and mumps were all nearly twice as prevalent as in the Expeditionary Force. It is possible that the wave of respiratory disease, which has been one of the most notable features in the health of troops in the United States during 1918, first struck the Expeditionary Force during the preceding year. However, an excessive pneumonia rate did not exist as evidence that the virus was the same as that which caused the pandemic of the autumn of 1918. The greater prevalence of mumps in France is not easily explained. It has been thought that most men susceptible to measles and mumps were exposed and attacked during their preliminary training in the United States. A comparison of the rates of measles at home and abroad would seem to justify this conclusion, but with mumps it has not been borne out by statistical evidence.

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SPUTUM-BORNE INFECTIONS ON TROOP TRANSPORTS

By Col. CHARLES LYNCH and Lieut. Col. JAMES G. CUMMING
Medical Corps, United States Army

(With one illustration)

WHEN the United States entered the war one of the big problems was that of transporting troops to France. This task fell upon the Navy and the Shipping Board. These two branches of the Government developed an organization and provided an equipment which, with the aid of ships provided by the British Ministry of Shipping, carried over 3,000,000 troops to and from France within two years. In addition to troops, enormous quantities of army supplies were transported. The magnitude of this task, it is thought, can nowhere be better appreciated than at a major port of embarkation such as Newport News, Va. In view of the magnificent showing made in transporting the great number of officers and men with their enormous supplies, criticism would be most unfair. Nor could there be any disposition to criticize on our part, for we know many of the difficulties, and our relations, at the many points of contact, with the Navy and the Shipping Board have been wholly harmonious and satisfactory from our point of view.

War on a great scale, however, almost always brings to light certain points relative to sanitation which previously have not been given due weight. We believe this to have been the case in the present war so far as sanitary messing is concerned. This applies to both the Army and the Navy. It is also always true that, even after the dangers of certain insanitary practices are appreciated, it necessarily takes some time to correct them. General education of the medical officers is necessary, in the first place, with the securing of support from the Army or Navy generally as the case may be. Then, too, it is often necessry to install new apparatus or to change that already installed. That has been the case with both Army and Navy.

In undertaking the transportation of troops to France it became necessary to secure all available ships, including not only merchant ships of the passenger type but also those formerly used as cargo carriers. The cargo spaces of both passenger and cargo ships were converted into bunk spaces with the idea of carrying human cargo to full capacity. In the conversion of these ships into purely troop carriers, the arrangements for the care, the preparation, and the serving of food were not overlooked; in fact, the arrangements on some ships were excellent, while on others it

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appeared that the marine architect responsible for the conversion had but one idea—that of utilizing every available inch of space for bunks, with little thought of the food or messing problem.

Before discussing the subject of this paper, a few words more of explanation are necessary.

During the last twenty years it has been recognized that food must be protcted from contamination by the organisms of intestinal diseases. Precautions to this end have been taken, and these precautions, in conjunction with typhoid vaccination, have given the American Army and Navy a record not before equalled by a force of equal strength. From recent reports it is indicated that the total deaths from this group of infections will not exceed 200 in the American land forces of almost 4,000,000 men. Equally good results have been attained by the Navy.

While the control of the fecal-borne infections stands out as a distinct success, in marked contrast to this the so-called respiratory infections caused upwards of 40,000 deaths in the Army. This high mortality indicates that the preventive measures as applied among our land forces were of little or no avail. It is our belief that the fundamental cause of this failure lies in the generally accepted belief that the group of so-called respiratory diseases is air borne. Practically all effort to prevent these infections has been directed to the direct or air-borne avenue of transmission. Coughing and sneezing, with their supposedly droplet infection, have been accepted as the route of infection from the sick to the well. In order to combat this avenue of transmission, masks have been used almost universally, and patients on hospital wards and in sick bays have been cubicled. Notwithstanding these efforts the mortality from this group of diseases has been excessive. In fact, we fail to find reports which indicate that this method of attack has met with results worthy of scientific recognition. We believe that as long as this group of diseases are accepted as respiratory infections only, there will be little or no advance in their prevention. The designation "Respiratory Infection" is a misnomer, and to express the avenue of transmission of these diseases in the term "Droplet Infection" is an error which leads, in the main, to misdirected preventive effort. Our investigation of the epidemiology of these diseases among troops in the field, as well as laboratory research, show the error of accepting the air-borne theory of transmission as the most important avenue of distribution. From these investigations the evidence points plainly to *indirect* contact through *inanimate object contamination* as the *major avenue of spread*. The most important indirect avenue of distribution among troops is at the common mess. Here, warm mess-kit wash water serves as the common focus for the exchange of mouth organisms. Contagion is not only added to this warm water from the

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hands and mess gear of unrecognized cases and convalescents, but this contagion is also taken away from the water by hands and mess gear, both of which are introduced into the mouth—with resultant infections in the case of non-immunes. So long as the water is only warm there is a continual addition and subtraction of mouth organisms. There is an incessant interchange of oral flora resulting in active cases of acute infections and in carriers of potentially dangerous organisms of the pneumonia type.

It may be laid down as a fundamental law that in large messing groups there are a few carriers who spread infection through either mess gear or tableware, and that the *large* messing groups, and the facility of transmision at the mess in the Army and in the public institutions, account for the excessive mortalities among these classes.[1]

Since the distribution of these acute infections is indirect rather than direct—for droplets fall rapidly to the floor— and since the major avenue of infection is at the common mess, and the minor avenue through contaminated inanimate objects, which we handle—while droplet infection is only of subsidiary importance—it is believed that the designation "Sputum-Borne Infection" has greater significance than "Respiratory Infection." The former designation from the preventive viewpoint is significant, since it is the sputum-soiled hand and eating utensil which are chiefly responsible for distribution; while respiratory infection gives the erroneous idea of air-borne transmission, and this is of only minor importance.

The object of this paper is to show the influence of mess-gear washing on the acute infectious disease rate among certain overseas troops arriving at this port.

As previously indicated, the method of washing mess-gear aboard troopships varied within wide limits. On some transports excellent arrangements for mess-gear cleansing and disinfecting were provided. These consisted largely of stationary tubs which are provided with steam coils for heating the wash water. Another arrangement consisted of troughs of water, into the bottoms of which live steam enters, providing water of a boiling temperature. It has, however, been occasionally found that the trough system is unsatisfactory in that the steam may enter only at one end of the trough. At the heated end the water may be boiling, while only warm at the other end. As the soldier prefers warm mess-kit wash water so that he may be able to wash the mess-kit with his hands, the trough system, when not properly managed, does not accomplish the desired sterilization of mess gear nor prevent hand contamination.

[1] Lieut. Col. James G. Cumming, M. C.: "Influenza-Pneumonia as Influenced by Dish Washing in 370 Public Institutions." In press, *Am. Jour. Pub. Health.*

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Although the equipment for mess-gear sterilization may be adequate, it should be pointed out that the personal element and continual supervision is a large factor. For example, one medical officer in charge of troops stated "that the water was kept about as warm as the men could stand it on their hands, but that it could be made to boil." In this instance the object of the equipment was temporarily defeated. In another case it was found that containers superimposed on steam baths were provided, but that these were commandeered, without the knowledge of the medical officer, for use as food warmers, while the troops used buckets of warm water for mess gear washing.

In a former report it was shown that the washing of mess-kits in tepid water was responsible for 80 per cent of the cases of influenza.[2]

Furthermore, in a subsequent report it was shown that the use of boiling water for washing mess-gear and the use of machines with boiling water for washing tableware in public eating places were essential to the prevention of influenza in camp and city.[3]

With the view of determining the influence of the temperature of mess-kit wash water as used by troops returning from overseas, transports were classified according to whether this water, as provided on each trip, was boiling or warm. Upon arrival at this port each transport was inspected and, as a result of the investigation, a classification of all troop carriers was made. This classification was determined by personal inspection and by statement of both navy and army officers aboard the ships, and consisted in dividing the ships into "A" and "B" classes. On Class "A" ships, boiling water was provided throughout the entire period of mess-kit washing. On Class "B" ships the wash water was in either stationary or improvised containers, and was of such a temperature as could be readily withstood by the hands. *The classification then was based entirely on the question of mess-gear washing in either boiling or warm water.* In this connection it is to be pointed out that a large number of ships (68) and troops (159,296) were included in the investigation, and that other minor influencing factors as crowding—all ships were crowded—air space, adequacy of food and clothing, duration of service, etc., would be equalized. There appeared to be but a single sanitary defect on Class "B" ships not found on Class "A" ships—that of insanitary mess-gear washing. In other respects there was no difference between the two classes of ships.

In the accompanying tabulation (Table II) it will be noted that 68 ships arrived during the period from February 18, 1919, to May 7,

[2] Lynch and Cumming: "The Rôle of the Hand in the Distribution of Influenza Virus and the Secondary Invaders." MILITARY SURGEON, December, 1918.

[3] Lynch and Cumming: "The Distribution of Influenza by Indirect Contact Eating Utensils." *Am. Jour. Pub. Health*, January, 1919.

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1919. Among these there were 44 Class "A" ships, and 24 Class "B" ships.

Several of the ships in both classes made two trips during the period of the investigation, and while a ship might be in Class "A" on one trip it would be in Class "B" on the other trip, or vice versa. Here we find that the determining factor, as to whether a ship was in "B" Class on one trip and "A" Class on another trip, depended upon the intelligent interest and knowledge of army and naval officers in regard to the importance of sanitary mess-kit washing. The incidence of the sputum-borne diseases, including measles, pneumonia, scarlet fever, influenza, diphtheria, bronchitis, tonsillitis, and meningitis, was secured from the

TABLE I.—*Class "A" Ships*

Number troops	Measles	Influenza	Pneumonia	Scarlet fever	Diphtheria	Tonsillitis bronchitis	Meningitis	Total
97,574	3	105	23	2	6	24	2	165
Class "B" Ships								
61,722	7	198	47	4	5	29	5	295

TABLE II.—*Summary of Infectious Disease Occurrence on Returning Transports with the Classification of Ships ré the Temperature of Mess Gear Wash Water.*

	Number of ships	Number of passengers	Total infectious diseases	Cases per M.
February:				
All ships	7	14,457	89	6.2
*"A" ships	3	6,648	14	2.1
†"B" ships	4	7,809	75	9.6
March:				
All ships	21	41,675	88	2.1
"A" ships	12	21,180	35	1.6
"B" ships	9	20,495	53	2.5
April:				
All ships	13	30,929	34	1.09
"A" ships	8	15,664	16	1.02
"B" ships	5	15,265	18	1.18
May:				
All ships	27	72,245	244	3.4
"A" ships	21	54,082	95	1.7
"B" ships	6	18,153	149	8.2
Total:				
All ships	68	159,296	455	2.9
"A" ships	44	97,574	165	1.6
"B" ships	24	61,722	295	4.8

* On "A" ships water kept constantly near the boiling point was used.
† On "B" ships water of a lukewarm temperature was used.

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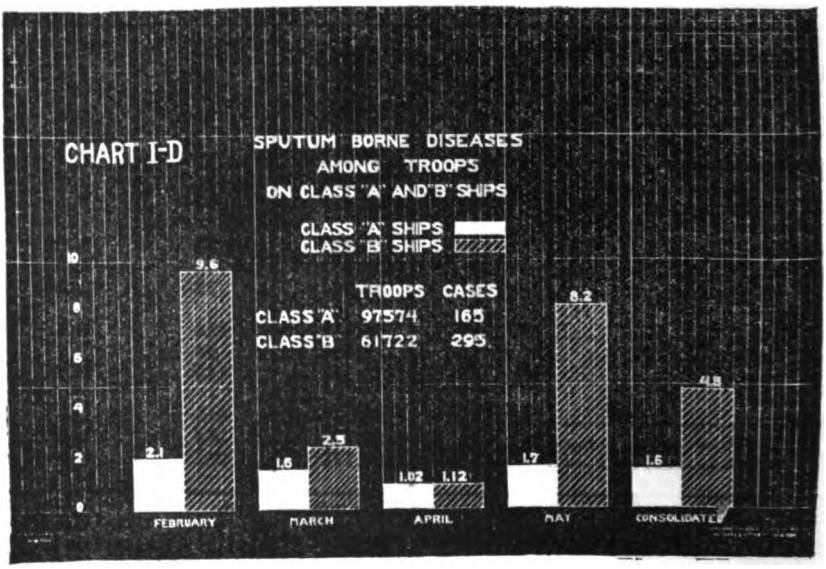
surgeon of each ship. Among the 97,574 arrivals on Class "A" ships there occurred 165 cases of sputum-borne infections, while among 61,722 troops on Class "B" ships there occurred 295 cases.

In Table I there is presented the number of cases of each infection arising on the two classes of ships. It will be noted that for the period of this investigation 40 per cent of the troops were carried on Class "B" ships, and that among these there occurred 75 per cent of the total cases.

In Table II there is shown the number of ships in the two classes, the number of troops, the total infectious diseases, and the case rates per 1,000 for each of the four-months period. From these data there is presented in Chart I-D the monthly and consolidated rates on the two classes of ships.

For the 97,574 troops arriving on 44 Class "A" ships the sputum-borne disease rate was 1.6 per 1,000 troops, while for 61,722 troops arriving on 24 Class "B" ships, the rate was 4.8 per 1,000. It is worthy of note that of the total 455 cases only 33 per cent occurred on Class "A" ships; or, in other words, on ships where boiling water was not provided for washing mess-gear, the rate of infection was three times greater than on those ships where the main avenue of distribution was blocked by the use of boiling water.

These findings verify our former reports on the influence of sanitary mess-gear washing on the incidence of the sputum-borne infections, and emphasize the importance of providing boiling water for mess-gear washing for troops and sailors.



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ABSTRACT OF REPORT OF PROFESSOR RUBNER MADE IN THE REICHGESUNTHEITSRAT, DEC. 20, 1917

(Concluded)

IN THE following pages we shall seek to give as impersonal a presentation as possible of the present health conditions of the nation, in so far as these may be regarded as dependent upon the altered food conditions.

In order to determine as exactly as possible the present conditions, the Imperial Health Bureau sent to the states of the Bund, Prussia excepted, as just such an investigation had already been carried on here, the following questionaire:

1. Are indications present that the health condition of the civilian population has been unfavorably influenced by the altered living conditions resulting from the war?

2. What is the nature of these indications?

Were they, for example, such phenomena as surprising loss of weight, extraordinary increase or decrease of contagious or other diseases as typhoid, dysentery, diphtheria, tuberculosis, venereal diseases, appendicitis, neurasthenia, skin diseases or other peculiar diseases, as for example, edema?

Did these indications consist of an increase of mortality in definite forms of illness or in a retardation of the process of recovery?

3. Have the injurious effects of the war appeared to any special extent among definite groups (for example, infants, school children, elderly persons above the age of fifty, pregnant women, manual laborers, mental workers, middle class, poor people), and, if so, in what direction have these results shown themselves?

4. How far are the changes observed in the health conditions attributable to the present food conditions? Can injurious effects arising from the composition or quantity of the bread, the eating of "Steckruben," decrease in allowance of meat, milk, or fat be proved to exist?

5. Have thorough and adequate experiments been made in institutions under government control, such as seminaries, prisons, insane asylums, infirmaries, etc.?

6. Did the phenomena mentioned under pars. 1 to 5 first occur to an important extent in that portion of the year 1917 and extending to the present time, or how far had they already shown themselves in the pre-

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ceding war years, 1914, 1915, 1916; or how far, in such phenomena as loss of weight, either a rally or a halt taken place recently?

These questions were answered by the medical authorities or by the communal representatives after consultation with physicians or other medical officials.

From the observations made in Prussia the following conclusions have been arrived at:

There is no general condition of famine, but there is famine to a greater or less extent in many large cities and towns with an industrial population. No exact idea of the amount of food procurable by the individual, legally or illegally, can be obtained owing to the complicated social conditions. The uniform ration is, however, insufficient. If all other nourishment is excluded, it will not suffice to maintain permanently the life of an adult. The unfavorable influence of the decreased diet is, for the most part, in the case of persons with callings demanding a moderate expenditure of muscle energy, balanced by a decrease in the work done. The same thing happens in the case of half-grown persons and children, who normally always have an assimilation affected by vigorous muscular activity, because of the limitation of this activity, decrease of vigor, and disinclination for play and sport. Somatic changes are for the most part shown most quickly in the case of persons of a sedentary mode of life, since here the possibility of limiting muscular activity is very slight. In the case of women these effects are shown later, in so far as they are not so heavy and, on the average, fatter than men. The quality of the diet, its digestibility, its impalatability, produce injurious effects according to the social position of the individual and the habits of life arising therefrom. In the case of old people also changes in the quality of the diet, because of greater losses of protein than appear in a diet inadequate merely through its meagerness, produce unfavorable effects.

The newly born come into the world unaffected by the food conditions. In the case of infants neither any injury nor any harm of any sort can be observed. Small children are on the average slightly thinner. In the case of sickly children and those with a poor constitution there often appears to be a retardation of convalescence and a transition from tendencies to illness to really disease conditions. In general the same thing holds true for children of school age as for little children. The unfavorable influences are, however, somewhat more sharply defined. Persons from 15 to 20 years of age are about in the same category with children of school age. The sickly and those with poor constitutions suffer so greatly from the war diet that mortality in many places has been affected.

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Healthy adults of from 20 to 60 years of age living under conditions of free social intercourse are in general thinner, but no less efficient than formerly. Exception must be made of a large part of the officials and those with fixed salaries, persons with small annuities, a part of the lower bourgeoisie, those who are not able to do a full day's labor but have to work more or less, and mental workers. In the cases of these, conditions of physical weakness and decreased efficiency more often appear.

Another exception is edema arising from an insufficient diet. In the case of the sickly who live under free social intercourse and those with poor constitutions, between the ages of 20 and 60 years, such sickness as tuberculosis, diseases of the respiratory and circulatory organs, pneumonia, intestinal troubles, and nervous diseases are more frequently fatal than formerly. The mortality of persons over 50 years of age has increased to an important extent. This is either the result of the insufficient diet or of the increased number of diseases caused by the diet or of the diminished power of resistance when disease has once broken out.

Adults living in institutions under close control, sometimes also the youths in the provincial educational institutions, suffer very severely, the healthy as well as the sickly and sick. Edema and death, in the case of other diseases that are not specific, are very often the result of the war diet.

Tuberculosis mortality has increased greatly. Fresh cases of this disease are likewise increasing to a significant extent. This is true for all classes, with the exception of infants, though small children do seem to present this phenomena to the same extent as the other groups.

The reports from the other sections of the empire complete this picture both as regards the favorable and the unfavorable features. As every journey shows, the food difficulties are not purely local phenomena.

It would be difficult to divide the cities and districts into definite groups and classes according to their lack of food. The greater the lack of food in the empire in general, the larger the number of places threatened and the more sharply are the results defined in the districts already affected. This is easily comprehensible, since the food regions about a city determine the extra supplies which are at the city's disposal to piece out the government ration. If we study the reports as a whole, we notice, in the circles that are suffering little from a food scarcity, that the persons making the report are still doubtful as to whether this or that surprising phenomenon belongs to the category of injuries due to the diet. But where the food scarcity has really begun, the judgments show a decided agreement. Cases of the latter sort furnish the

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standard for an understanding of the matter; through them we find also the thread connecting with the first years of the war and the beginning of the present conditions, and with the symptomatic prodromal phenomena.

In perfect agreement with the Prussian experiments it is shown that there is no question of a general imminent danger to health in all cities; and, further, the food shortage, especially in many large cities and above all in industrial centers, has reached a very considerable degree. Inasmuch as the general food system is regulated by the central government, this shortage is caused both by lack of foods that may be obtained with food tickets and by the meagerness of other supplies from the rural districts; it is certain that people in the country, if we disregard the occasional reports that women have been injured by overexerting themselves in performing hard labor, have not suffered from an insufficient food supply, but the same thing is true of many small cities, which, because of their particular location in relation to rural districts, have been abundantly provided with supplies to piece out the general ration, or, in some way or other, self-providers as regards some sort of food. Complaints are, however, growing numerous, and the health situation is getting serious, especially where populous cities lie within a rather unproductive rural district. Such is the case with Berlin and several other large cities. From the rationed foods the people cannot obtain sufficient nourishment, and the supply of other kinds of food to be procured legally or illegally is very scanty.

Individual states of the Bund have, apart from certain inequalities in some provinces, a general type of more or less adequate food supply. To take a few examples, the conditions in Wurtemburg, northern Baden, Alsace, some sections of Thuringia, Waldeck-Schwerin, Oldenburg, parts of Brunswick and Mecklenburg are locally very favorable. Saxony, on the other hand, of all the states of the Bund, is in the worst situation. There, too, conditions often vary greatly in districts not far removed from one another. In Saxony the supply of the rationed food seems not to have been assured at all times. Among other things the meat supply was very scanty, and the use of "Steckruben" as a substitute for potatoes, or even for increasing the production of bread, appears to have become very extensive, as it is more often mentioned there than in reports from other places.

As a further result one may note the fact that there is general agreement that during the first two years of the war no real injury of a serious nature could be observed in that part of the population who lived under no restraint, even though certain slight disorders, which later appeared in more distinct form, did appear as forerunners of more serious dis-

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turbances. The beginning of these serious consequences is commonly considered to be the summer of 1916 or from October, 1916, on. The milk supply has had an especially unfavorable effect upon conditions, although on this point it would have been possible to have secured larger deliveries. From the nature of the case, essential changes in the health of the nation do not occur simultaneously with the issuing of the new decrees, but, like the decrease in weight and the accompanying phenomena dependent upon this, will not be noticed until after the lapse of a certain time. In individual instances this may be quite exactly observed. Moreover, the effects of the decrease in the food supply is confused with the inevitable consequences of the uneven distribution, which already has been discussed along with other general considerations.

A number of phenomena can be explained, without further investigation, by the anatomical changes that result from a loss of fat. With the disappearance of the fat comes an extension of the inguinal canal and a diminution in the mass of the intestinal coils. Accordingly there is reported an increase in the necessity of operations for hernia. Intestinal obstruction occurs more frequently. Deterioration of the female sex organs is reported. There appears to be an increase in the number of cases of appendicitis. A phenomenon, which is tremendously widespread, and apparently appears wherever the war diet is closely followed, is the increase in the voiding of urine during the night. Because of this the nightly rest of many persons is disturbed or even insomnia arises. Bed wetting is increased very much among children and in numberless cases is reported of adults also. This is certainly to be regarded as alimentary polyuria, and has already been stated and explained.

With the deterioration in the condition of the cells is associated the poor blood supply. Complaints concerning anemia are universal. Along with the laying off of the cell content in general there is evidently a lack of material for the reconstruction of cells in the service of forming blood or any further cell reconstruction or regeneration, or for the formation of secretions and other things of a similar nature.

An unwelcome phenomenon, which is increasing from month to month, is the retardation of menstruation in the case of women and girls of all classes. The more unfavorable the food conditions, the more prominent are the data in the reports concerning this matter. Even in the case of inmates of institutions under governmental control this fact is everywhere emphasized. Obviously many of the persons making the reports have not mentioned this disturbance in menstruation, because it has so happened that no complaints have come to their attention. So widespread a phenomena of this nature in a period of enormous decrease in

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the birth rate leads one to assume a connection between the two circumstances or to suspect this to be one of the causes that has worked toward a diminution of the birth rate. In all probability its cause is to be found in the great lack of protein in the diet, because of which the normal restoration of the blood cells is diminished, and because of a lack of blood the normal bleeding that takes place during menstruation does not occur and a favorable factor in the process of fertilization is thereby lost. It is also a question whether the formation of the egg itself is normal and whether the egg possesses all normal qualities necessary for development.

Of the sexual organs of the male, the reports naturally contain very little. Before any such reports can be made a thorough investigation is necessary, but now and then mention is made of a decrease in the libido sexualis. This might be connected with the extreme atrophy of the testicles which has been noted on the bodies of the poorly fed persons on the eastern front. Spermatogenesis is also much diminished.

An increase in skin diseases, even those of communicable nature, among both children and adults, is noted on all sides by the men who make the reports. Although there are many indications that the skin itself suffers from poor nourishment, there is no way of determining what portion of the skin diseases is due to lack of cleanliness necessitated by the lack of soap. Because of the further restrictions upon the coal supply and limitation of bathing facilities a further increase in these diseases will probably take place. The frequent occurrence of furuncle, reported from various sources, arises from the want of clean linen, the lack of cleanliness, and also from the diminished powers of resistance in the tissues. The itch and maw-worms are also quite widespread, a fact which is attributable to the altered conditions as regards cleanliness.

There has of late been considerable talk about heart trouble arising from the loss of flesh, but the reports do not give any definite data regarding this question.

There is nothing to confirm the idea that the venereal diseases are of frequent occurrence. The same is true of typhoid fever, diphtheria, and many other infectious diseases, except dysentery and tuberculosis.

No increase of insanity can be proved to exist, even though neurasthenia and the like have increased, as might well be expected from the very nature of conditions in war-time. Eclampsia has decreased; epilepsy has increased.

Concerning the increase of tuberculosis, all authorities are in perfect accord. As an important cause of this the revivifying of old foci under the influence of poor diet is cited, or severe and more rapid course in the disease itself is reported. Tuberculosis in its incipient stages is mentioned

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as being found incidentally in post-mortem examinations. For children, the danger of tuberculosis has increased.

In numerous cases a more rapid unfavorable course of the disease is reported as regards cancer; it seems to be chiefly a question of lack of food suitable to restore the patient. Mention is also made by many good authorities of the frequency of cases of cancer.

With great optimism one regarded, during the early years of the war, the relation of the altered diet to the stomach and the intestinal canal. In the daily press and in the medical press many physicians seemed unable to do enough talking about the blessings of the war diet, because on account of it all stomach and intestinal diseases arising from over luxurious diet, etc., had disappeared from the face of the earth. Quite different were the reports concerning the past winter and the summer of 1917. The war diet is considered to be the cause of the numerous cases of stomach and intestinal catarrh, which at various times have affected almost all the inhabitants of many cities. The fact is emphasized that the urban population, more than the rural, suffer from these troubles.

Sometimes the disease is called cholerine; sometimes it is complicated by fever, attacks the small and large intestines and is similar to dysentery. In many towns numerous deaths have occurred. Since cases of real dysentery have occurred and no exact investigation of the individual cases was possible, no sharp distinction can be made. To regard all cases in general as dysentery is not to be thought of. The term often used, "similar to dysentery," only means that no real dysentery was present. The cases were accompanied by a general condition of weakness. It seems an important fact that the cases were first observed in those sections where the food conditions were very unfavorable, as in Saxony, and that they were then tremendously widespread. Convalescence was very slow, as there was scarcely any possibility of procuring any improvement in the diet. As one report states, the sick and the convalescent were always obliged to expose themselves anew to the old injurious conditions. The disease was also very widespread in the institutions under governmental control, in which, with few exceptions, the food supply left much to be desired.

Concerning the cause of these stomach and intestinal troubles, mention is made in most reports of the deterioration of the diet, and from many sides comes the hint that this may have played a part in determining the course of the disease. Through the weakening of the body it was no longer possible, they say, to stand the poor diet. An examination of gastric juices in two towns situated far apart proved that there was a lack of free hydrochloric acid.

If we disregard the condition of the half-grown, concerning which we

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have no exact data, and consider adults according to their position and calling in life, it is shown that the working classes are at least relatively better cared for than other persons. As between man and woman, the man is usually at a disadvantage, as is easily understood and has already been mentioned from the claims a man has upon nourishment and the nature of the rationing system.

The laboring classes enjoy the advantage that in the cities employes and employers meet to discuss the extra ration, as a result of which their bread supply, etc., is increased as a general thing, and the worker is placed in a more advantageous position than the other classes. Sometimes this affects the mechanic's trade in a very uneven manner: the master does not get extra rations, but the apprentices do. Persons who are not members of the Sick Benefit Fund are also less favored than others as regards rations. From the reports it is plain to be seen how much more the middle classes have to suffer than do others; for example, the laboring classes, who for the most part receive in national kitchens, as war workers, through canteens, etc., quite a quantity of extra supplies that are inaccessible to others. Only the remnant of these supplies that are not needed for the war industries, for welfare institutions, such as national kitchens and canteens, can be procured from the open market. Academic professions and mental workers obviously come out at the small end as regards the food supply; for this category the uniform ration must suffice.

The heating question is directly connected with the food question, and this can be said also in the matter of clothing as a means of procuring warmth for the body. A lack of warmth brings about a considerable increase in the amount of food required. Inasmuch as the supply on hand to meet this demand has in the course of this paper been shown to be permanently below the requirements, and in part dangerously so, the poor coal supply further heightens the danger to health and causes an increase in mortality. The heating question is therefore not a matter of procuring merely the comforts of life, but one that must be absolutely considered if we are to hold out. The need of heating is increased at present. Insufficient blood-building comes from insufficient nourishment, and on account of this lack of new blood the sensation of cold arises, a sensation that tortures the poorly nourished in a temperature that does not affect the well nourished at all. In respect to the spread of tuberculosis and the heightening of its symptoms, any increase in colds and catarrh as a result of lack of heating is of great importance. Elderly persons, in general, suffer more from the effects of cold than do younger persons.

As concerns the coal supply, very varied effects are produced in vari-

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ous households, the most unfavorable in the large residences, as results naturally if we consider the amount of fuel necessary for maintaining a sufficient degree of warmth. The allowance is scarcely sufficient for a few rooms, leaving the other rooms, which must be used when the inmates pass from one part of the house to another, in a very cold state, which creates the most favorable conditions for catching colds. To enter into greater detail on this question would carry us beyond the scope of the matters under consideration.

The ills and dangers threatening that part of our nation living in the cities has been clearly enough described in the reports; the results of the Prussian investigations, too, are confirmed by statistical evidence. In the cities that were carefully investigated there was found to be greater mortality, increasing with age; for those above fifty the mortality has increased especially since the spring of 1917. Since epidemics, which might disturb our totals, do not enter into this consideration and the increase of tuberculosis is to be included in our study of the effects of the food conditions, we are justified in claiming that the increase in mortality, which in Berlin, for example, is considerable, is to be regarded as a reaction of the inadequate food supply upon mortality.

General improvement in the food conditions in many cities is a question of such great importance for the government that all measures must be taken to alter thoroughly the conditions that have thus far prevailed in those places that are suffering from famine. Our future national energy is at stake.

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OBSERVATIONS ON 500 CASES OF SCARLET FEVER[1]

By Major JOHN B. LUDY, Captain ERNEST L. HUNT, and Captain LLOYD H. COGSWELL

Medical Corps, United States Army

(With two illustrations)

DURING the influenza epidemic at this camp, several cases of suspected scarlet fever were admitted. It was noted that they were of the septic type, but, during the confusion following the admission of so many more patients than the hospital normally accommodated, they were discharged after convalescence was established without full observation having been made on them and adequate quarantine enforced.

During the early part of November, 1918, twenty six men arrived at this camp. Inspection revealed that six of this number were in a desquamative stage of scarlet fever.

It is believed that a predisposition for scarlet fever is engendered by the presence of any form of catarrh, especially if localized in the fauces. The influenza epidemic just closing afforded an excellent opportunity for the engrafting of the causative factor of scarlet fever.

In the months that followed, there were 500 cases of scarlet fever admitted to the hospital. Of this number, there were several toxic cases with fatal issue, eight septic cases with fatal issue, bronchopneumonia playing the final rôle. The remaining cases were, for the most part, of simple scarlet fever. A constancy of type (the simple variety) characterized the epidemic.

Our receiving ward records show that 2 per cent of our admissions for scarlet fever were in the desquamative stage on admission. The subjective symptoms were insufficient to make a report on sick call necessary during the period of their infectivity, and the objective symptoms were apparently insufficient to attract attention, or the type was "*Sine Eruptione.*"

Nausea, vomiting, and sore throat were the initial symptoms in 15 per cent of the causes; 75 per cent had sore throat and headache; 10 per cent were admitted because of eruption; eight cases had urticaria as the initial symptom.

A general adenopathy was the rule. Submaxillary and bilatereal inguinal lymphadenitis was noted in 100 per cent of the cases. The adenopathy began to manifest itself after the first twenty-four hours. The inguinal glands would be soft, markedly palpable and tender, the

[1] Camp Hancock, Augusta, Georgia, November and December, 1918; January and February, 1919.

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tenderness in some instances amounting to pain. These symptoms would continue for four or five days, after which subsidence to normal was the rule.

The glands were movable, could be slipped between the thumb and forefinger, were sensitive and felt soft and elastic. Some were dissected out and others were obtained at autopsy, and all showed an acute inflammatory process characterized by congestion of capillaries, slight diapedesis of red cells and especially by the presence in the sinuses of plasma cells and endothelial leucocytes, many of which latter were phagocytic to red blood corpuscles and other leucocytes. Dr. Lamar called attention to the absence of follicular hyperplasia and the general likeness of the process to the lymphadenitis occurring in typhoid. There was no tendency to suppuration.

The cheeks were from the very first day suffused with a vivid flush. This condition would last from one to several days, after which a fine, powdery desquamation would ensue, the first sign of peeling. Circumoral pallor was characteristic and seemed of value in distinguishing it from the other eruptive fevers.

The eruption in a good many cases was very evanescent, disappearing often in a few hours and attracting little or no attention. That the eruption was evanescent and unnoticed by the patient and his tentmates is proven by the fact that 2 per cent of admissions were during the period of desquamation, the patients not remembering ever having had an eruption of any kind and not aware of any contagion until their curiosity was aroused by appearance of the desquamation. The rash, punctate in character, usually appeared after the first twenty-four hours. The location was on the upper chest, neck, and upper arm, and often in another day would cover the trunk and lower extremities. The axillary region, the groin, and the bend of the elbows, showed the rash in the most characteristic form and persisted in these localities the longest. In some instances, a secondary rash—erythema simplex—was superadded, which was, however, of a transient character and would disappear before the puntate eruption. Slight pressure with a glass slide would cause the erythema to disappear, and the fine papular or punctate rash would alone remain. The erythema would be more or less generally distributed involving the cheeks, neck and body generally. The palms and soles were free of any eruption. The cheeks were always free of punctate eruptions. The secondary erythema, as described, was present in over 60 per cent of the cases.

A folliculitis was observed in 9 per cent of the cases that had a pronounced rash. This was observed during the second week and was noted on outer surfaces of arms and legs.

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The mucous membrane of the fauces, the palate, and the uvula were deeply injected in the septic cases, attended usually with an inflammatory edema. In the mild throat these symptoms were correspondingly less. Punctate eruption present on the palate (hard and soft) would vary in its intensity with the type of the disease. The throats of the scarlet fever patients were more diffusely congested than is observed in ordinary tonsillitis.

In the more pronounced cases, the tongue, during the first day, rapidly coated, with a thick, white fur, as a result of the active proliferation of the normal epithelium. On the second day a denudation of the epithelium occurred which, by the end of the third day, was usually completed, giving a red appearance. This denudation usually began at the tip and edges and rapidly enveloped the entire tongue. The fungiform papillae were usually observed appearing through the white coating. After the third day, with the tongue denuded of its normal epithelium, the classic "ripe strawberry" tongue would appear. Be it noted that the completeness with which the tongue peeled was directly proportionate to the degree of inflammatory injection of the faucial and buccal mucosa, and that in cases of mild scarlet fever one found an atypical strawberry tongue. After from seven to ten days the epithelium of the tongue began to restore itself. Seventy-two per cent of the cases showed some degree of strawberry tongue.

After the first week, peeling began on the neck, chest, and inner surface of the arms. After a second week, peeling was general. After four weeks peeling was usually complete, with the possible exception of the hands and feet. The amount of desquamation was usually proportionate to the intensity of the eruption; consequently the milder the eruption, the less the desquamation. In one series of ninety-nine cases which showed desquamation, thirty-five did not have any eruption during their period of hospitalization, and no history of their having had any eruption was obtained. Many of the other cases that did desquamate had a very evanescent eruption and the possibility of the above thirty-five having had an eruption of few hours' duration should be considered. There was no case that developed scarlet fever intramurally with subsequent desquamation, that did not have some eruption, however slight. The history of one case showed desquamation starting at the usual time and completed in four weeks, which, shortly after discharge from the hospital, began to re-desquamate on his hands and feet.

A moderate hyperleucocytosis existed until after the disappearance of the eruption, when it began to subside, and by the end of the third week the count was usually normal. An absolute and relative increase of polymorphonuclear newtrophiles was present during the period of

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hyperleucocytosis. Eosinophilia was a diagnostic phenomena. This usually began the third day of the disease and increased during the succeeding four or five days after which the percentage decreased, although continuing until long after convalescence. Tonsillitis and other septic conditions can be differentiated by the absence of this cosinophile increase.

Eosinophilia shown by our cases as follows: 36 per cent showed over 5 per cent, 10 per cent showed over 4 per cent; 11 per cent showed over 3 per cent; 43 per cent showed between 2 and 3 per cent.

Leucocytosis shown by our cases as follows: 40 per cent showed between 7,000 and 10,000; 12 per cent showed between 10,000 and 12,000; 19 per cent showed over 12,000.

It was noticed that the type of the disease, the intensity of the eruption, and the degree of desquamation bore a direct relationship to the blood findings. The more marked the prodromes, the greater the leucocytosis; the less the eosinophilia, the less was the desquamation. The laboratory made differential blood counts on one hundred healthy individuals and reported an average eosinophilia count of 0.35.

The average temperature was 101.5, the highest being 104.6. Some of the mild cases had a temperature of a day's duration, and this less than 100.

The average pulse rate was 110. The highest pulse rate recorded was 152.

Urine.—In ninety-two cases, the urinary findings were as follows: 1 per cent had albumin only; 2 per cent had hyaline casts only; 28 per cent had both casts and albumin in quantity; 61 per cent were negative.

In thirty-four cases in which bi-weekly urinary examinations were made, the report shows the following:

First week: Albumin, 67.3 per cent.; casts, 35.3 per cent; albumin and casts, 35.3 per cent.

Second week: Albumin, 58.8 per cent; casts, 14.4 per cent; albumin and casts, 14.4 per cent.

At the end of six weeks: Albumin, 8.8 per cent; casts, 2.9 per cent; albumin and casts, 2.9 per cent.

Complication: Otitis media, supperative, acute, 11 per cent; bronchopneumonia, 6.5 per cent; arthritis, 5.9 per cent; mastoiditis, 2.9 per cent; relapses, 3 cases; jaundice, 3 cases; diphtheria, 1 case.

In one of our wards with 70 patients, 25.7 per cent gave a history of having had influenza since October, 1918.

5.7 per cent gave a history of previously having had scarlet fever.

36.2 per cent had positive streptococci in the throat.

44.3 per cent had a temperature of over 100.

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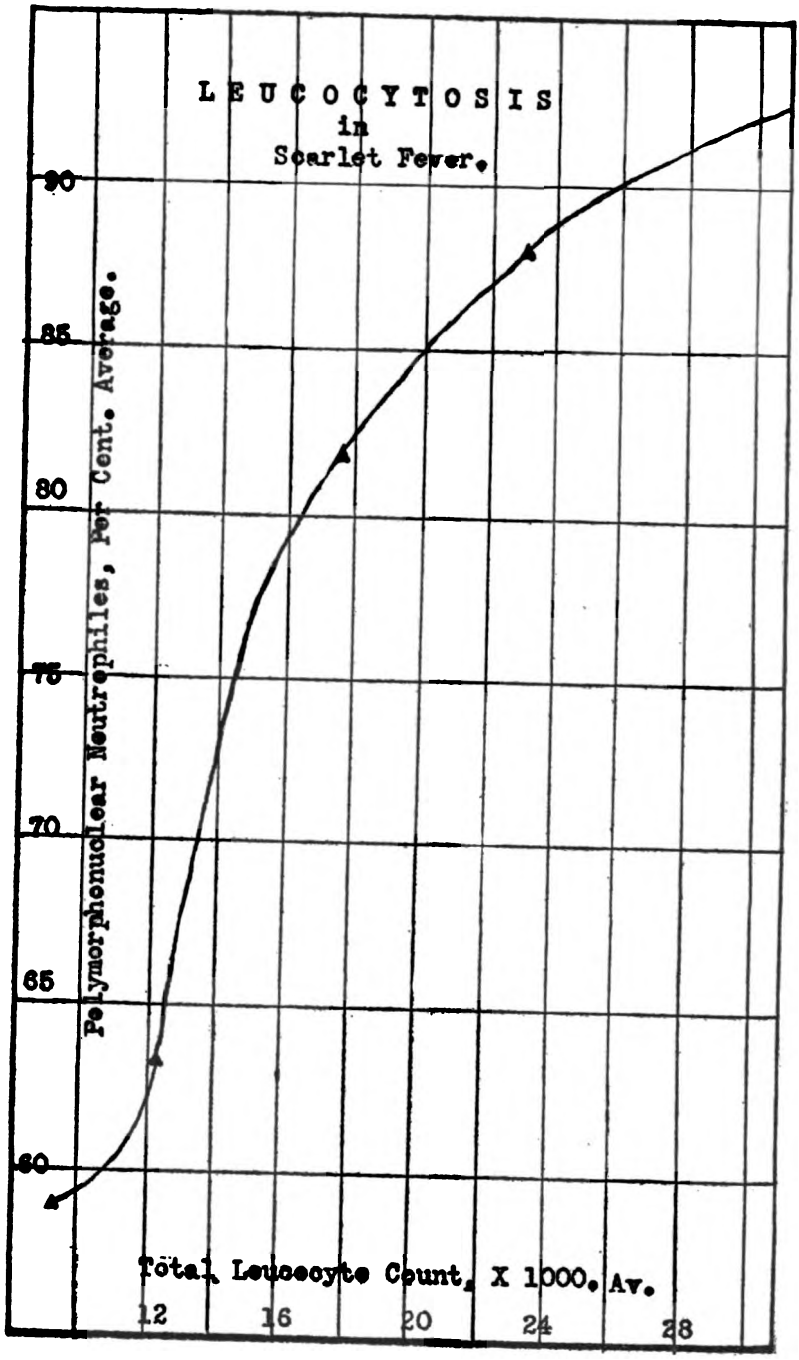

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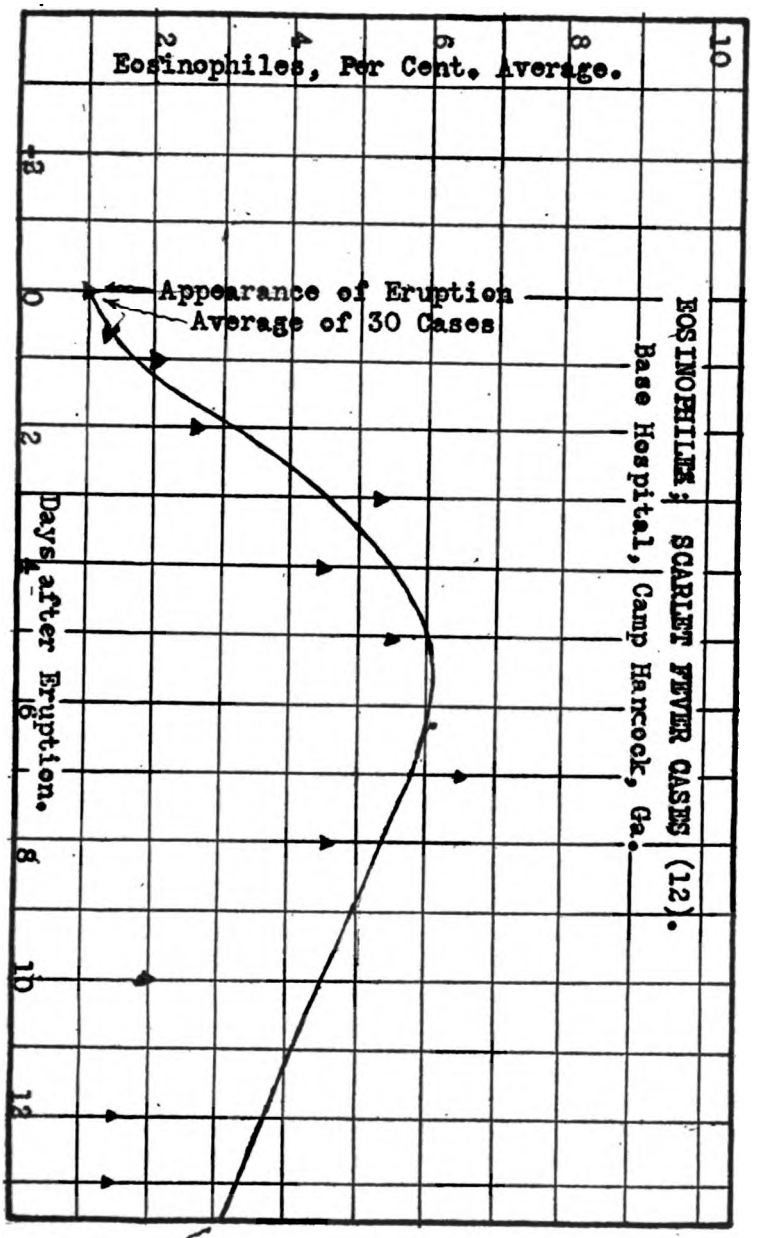

30 Cases Av. 2.4 % when Desquamation is complete (4-6 weeks).

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55.7 per cent had a temperature of less than 100.

100 per cent had more or less general lymphadenitis; all had inguinal adenitis.

92.8 per cent had strawberry tongue.

35 per cent were admitted with eruption.

65 per cent had rash before admission.

92.9 per cent had appreciable eruption on hard and soft palate associated with more or less injection of the fauces.

70 per cent had marked desquamation.

Location of eruption: Neck, chest and abdomen, 40 per cent; entire body, 26.5 per cent; chest and neck, 17.6 per cent; chest and back, 5.9 per cent; chest and arms, 5.9 per cent.

Of the milder types of the disease 48 per cent were from the north and west, while 52 per cent were from the south.

Of the cases with all usual symptoms markedly present, 99.2 per cent were from the north and west, while 11.8 per cent were from the south.

In several of the cases the desquamative period was delayed; in these instances the desquamation was preceded by a dusky erythema not unlike that preceding a dermatitis exfoliativa. The desquamation was simultaneous and universal in these cases. It was also noted that the white blood count of these cases at time of eruption was 5,000 or less, and at the time of desquamation 10,000 with marked eosinophilia.

The cases of relapse occurred during the second and fourth weeks, after convalescence seemed well established. Repetition of all symptoms occurred, except that the mild cases were more severe and the previously severe type more mild.

The mortality rate was 2.5 per cent.

Autopsy on these scarlet fever cases showed marked enlargement of the mesenteric and retro-peritoneal glands and of the spleen.

Summary—In this series of cases the constancy of bilateral inguinal adenitis in the early days of the disease was striking, and when occurring with any one of the cardinal symptoms such as angina, strawberry tongue, erythema, punctate rash of the distributions described, fever with hyperleucocytosis or eosinophilia, may be considered as of decided diagnostic importance, and under epidemic conditions, as justifying a diagnosis of scarlet fever.

Furthermore, it seems probable that "*Scarlatina Sine Eruptione*" does occur, and under epidemic conditions certain cases may be diagnosed and quarantined as having the potentialities of carriers.

Our thanks are due to Dr. R. V. Lamar, Professor of Pathology at the University of Georgia Medical School, for pathological work, and for valuable suggestions and advise.

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DIPHTHERIA IN THE AMERICAN EXPEDITIONARY FORCE

By Major MARCUS P. NEAL and Captain ALAN C. SUTTON
Medical Corps, United States Army

INTRODUCTION

FOR a disease with such simple and ideal therapeutics and with methods, laboratory, etc., which on the face of them would seem to offer an almost exact means of control, diphtheria caused a large amount of incapacity among certain troops in the A. E. F. and was continually one of the chief sources of worry to those responsible for the control of infectious diseases. The largest single factor affecting the prevalence of diphtheria in the A. E. F. was the overcrowding in sleeping quarters, especially on the transports, a matter unavoidable in the military emergency which existed. This, however, is no reason for lightly laying aside the burden of responsibility. An endeavor, is here made to give a careful résumé of the more important outbreaks of diphtheria, including both, the manner of spread and the steps taken to bring them under control. Each of the methods of control now generally in use is passed in review, and in the light of our experience an estimate is given on both their value and their shortcomings. Finally, conclusions are formulated as the basis of a series of recommendations covering the steps to be followed in controlling a diphtheria outbreak among troops under the various conditions that one encounters.

Diphtheria ranked fourth among the infectious diseases as causes of days lost in hospital the first three being mumps, measles, and scarlet fever.

Prior to our active participation in the fighting—during the year ending May 31, 1918—there were 84,892 cases of the following diseases, a group largely influenced by overcrowding: Pneumonia, meningitis, measles, mumps, diphtheria, influenza.

During this period this group comprised one-third of all cases due neither to injury nor wounds received in action.

In March, 1918, during the week ending March 17, the incidence rate of diphtheria per 100,000 was higher than recorded at any time in the allied armies after January 1, 1915, in the B. E. F. This was almost entirely due to the epidemic in the 32d Division.

The following table giving the number of cases of diphtheria per month and the rate per hundred thousand is taken from Col. Haven Emerson's report in Part I, Chapters I and II, on "The Prevalence of Communicable Diseases in the A. E. F." Reference should be made to

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that chapter for charts, general statistical details, and comparisons with the other allied armies.

Months	1917		1918		1919	
	Total number of cases	Rate per 100,000	Total number of cases	Rate per 100,000	Total number of cases	Rate per 100,000
January	.....	.....	17	9.0	382	21.1
February	.....	.....	46	20.1	378	22.7
March	.....	.....	266	92.9	331	22.1
April	.....	.....	232	53.1	195	16.3
May	.....	.....	329	65.4	161	14.6
June	.....	.....	332	45.0	.....	.....
July	13	83.6	251	25.4	.....	.....
August	10	37.5	364	33.8	.....	.....
September	18	40.3	312	20.6	.....	.....
October	8	11.4	341	19.6	.....	.....
November	5	4.7	388	26.3	.....	.....
December	18	12.7	478	25.0	.....	.....

There were 62 deaths due to diphtheria prior to June 1, 1919, which is a case mortality of 1.3 per cent.

With a combat army where the medical problem is to keep the soldier at the front, in fighting trim, and under conditions where not a single man could be spared, the continual presence of a large amount of endemic diphtheria with several epidemics, and always having a higher rate than either the British or French armies, gave one the continuous sensation of sitting on a threatening volcano, which might suddenly become more dangerous and, by even temporarily incapacitating a much larger number of troops, become a serious factor in the efficiency of our Army.

General Features of Diphtheria in the A. E. F.

The presence of diphtheria in the A. E. F. and the problems encountered in the efforts made to control this disease can be divided advantageously into four periods for purposes of description and study.

(1) The 1917 period. During this time the rate per 100,000 averaged 31.7, which was only surpassed during the four months that marked the height of the epidemics of the next period. There never were, however, more than 18 cases at any one time during this first period, this being the maximum number for any month prior to February, 1918. This period was prior to any real laboratory organization in the A. E. F. The control was handled almost entirely by the local medical officers in each case.

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(2) The period covering the first six months of 1918, when troops were brought overseas in large numbers on crowded transports and then placed in training areas or quiet sectors of the line. During this period the problem was chiefly in the divisions. The 32d and 35th Divisions were the worst affected. The control at this time was handled almost entirely by the Central Office Personnel[1] and is characterized by the introduction of two things: (*a*) the use of extensive field laboratory work in the search for carriers, and (*b*) the protection of all susceptible individuals, as determined by the Schick test.

(3) The period of active operations extending from the troop concentration prior to the St. Mihiel offensive to the signing of the armistice. During this period all the divisions, including those in which diphtheria cases were still occurring in fair numbers, had to give practically undivided attention to the problems of active combat, the care and evacuation of the wounded occupying 90 per cent of their thought. Time was not taken for careful bacteriological examination in cases of sore throat even clinically suspicious of diphtheria. Suspected cases could no longer be hospitalized in the division area. All sick unable to do full duty were evacuated, their places being filled by fresh replacements. As a result, diphtheria ceased to be a divisional problem, but became concentrated in the hospital centers in the interior to which these men, evacuated from the divisions, were sent. In addition to the rapid evacuation of all sick, most of the divisions had left their laboratories behind owing to the shortage in transportation, so that, as a rule, no throat cultures could have been taken even if time and personnel had been available during lulls in the fighting. The control work during this period was done by hospital center laboratories "playing on their home-grounds," the Central Office acting only in an advisory capacity when necessary. The chief handicap was an overcrowded hospital and an overworked personnel.

(4) The period of occupation, following the organization of the 3d Army. Here the question of exposure to civilian cases became an important factor. The methods of control, especially during the early months of the Army of Occupation, were similar in many respects to those of the first period. Reliance was placed on early isolation of suspicious cases accompanied by careful quarantine measures. Little or no systematic search for carriers was made. They were dependent chiefly upon the main laboratory at Coblentz, which was not completely established until several months after the organization of the 3rd Army.

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[1] "Central Office" as used hereinafter means the Office of the Director of Laboratories and Infectious Diseases, Chief Surgeon's Office, A. E. F.

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Historical Description of Diphtheria in the A. E. F.

During the *First Period* (the period of 1917) the incidence of diphtheria per 100,000 was high, although the actual number of cases was never large. At this time there were only the few base hospital laboratories where their own patients were cultured and the U. S. Army Laboratory at Neufchateau where throat cultures taken among troops in the Zone of the Advance could be sent. This of course rendered the consideration of extensive laboratory examination of all contacts out of the question as an available means of control. In consequence, among the troops entire dependence had to be placed upon the early diagnosis of cases, with the isolation of each suspicious case until the diagnosis could be cleared up, and the rigid enforcement of quarantine measures upon all contacts. This proved satisfactory in preventing a serious epidemic at this time. In weighing this result with those obtained later, when, in addition, extensive laboratory investigations were used, one must not lose sight of the fact that there was not yet the factor of serious overcrowding. The troops were more stationary, and their duties were such, since we were not yet relied upon to hold an actual front line sector, that time could be taken to carry out to the letter all quarantine measures.

In the *Second Period* we see the first serious introduction of diphtheria into the A. E. F. It was brought over especially by two divisions, the 32d and the 35th. Already existent in these divisions while in cantonments in the States, the smouldering fire was fanned into a blaze by the enforced overcrowding on the transports and for a time after arrival in the divisional areas in France. Fortunately, out of a total of 42 divisions in France, only these two were seriously involved with this disease.

Among the earliest outbreaks of diphtheria that came under the supervision of the Central Office after its establishment, February 1, 1918, was a small epidemic at the 1st Corps School located at Gondrecourt in the 1st Division area. The cases were cared for at Camp Hospital No. 1, then operated by the 1st Division. Fourteen cases occurred between March 2 and 9 (the diagnosis was based on the clinical picture and a throat smear as there were no facilities for incubation of cultures at the camp hospital). On March 9 a mobile laboratory was sent out by the Central Office. All immediate contacts of the previous cases were cultured and the most intimate contacts, ten in all, were given a Schick test. One of those Schicked and considered negative after forty-eight hours developed diphtheria the next day. Two other new cases developed at the school the following day. Then all the 70 men occupying the same barrack and a few others, who were considered contacts, were cultured and given the Schick test. All who

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had positive Schick reactions were given 1,000 units of antitoxin. The report does not give the number of carriers found. No other cases occurred at the time. Diphtheria, even in a small amount at such a school, is always serious and demands the most careful attention, for the personnel is drawn from many organizations, with the result that those who have become even temporary carriers by contact with a case offer a most excellent way to disseminate the disease throughout the Army when they return to their organizations at the end of the course.

A week later, March 25, a case of diphtheria occurred in one of the camps (Camp Travis) for the enlisted men on duty at General Headquarters. The case was at once sent to the hospital. All contacts were isolated, and the troops in the camp were quarantined. Owing to the seriousness of any epidemic at a general headquarters, drastic measures were at once instituted. A mobile laboratory was sent out from the Central Office. The entire camp of 468 men was cultured and given the Schick test. Sixty-eight gave positive Schicks, and 6 were withdrawn as carriers. No additional cases occurred.

Diphtheria in the 32d Division

The first diphtheria epidemic of any serious nature in the A. E. F. occurred in the 32d Division. From the time of arrival of this division in France (March 5, 1918) until the beginning of active operations at Chateau Thierry (July, 1918), the presence of diphtheria in this command was a source of constant anxiety, requiring the persistent efforts of special epidemiologists and laboratory personnel in order to keep it under control. The dangers resultant upon the presence of diphtheria in this particular division were enhanced by the fact that it was functioning at this time as a replacement (or depot) division, thus affording an easy path for scattering the disease throughout the combat divisions.

Prior to the arrival of the division in France, the first case of diphtheria of which there is a record occurred in the 119th Machine-Gun Battalion, just before leaving Camp MacArthur (on February 4, 1918) at Waco, Texas, where the division was organized in August, 1917. Another case developed in this same outfit en route to Camp Merritt, New Jersey, where the division was assembled prior to embarkation for France. One case developed in the 127th Infantry while at Camp Merritt. This regiment disembarked at Bordeaux on March 7, having been detained in the harbor on board ship for three days. While at sea, one man in Company G had developed diphtheria and died. This regiment was held in the concentration camp at Bordeaux for several weeks, not reaching Prauthoy (10th Divisional Area) until April 10, where it rejoined its division. While at the Bordeaux camp six more cases developed in Company G and a number of other cases in Com-

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panies I and L (four cases occurring in one billet). While there most of the men, according to their statements, were cultured by the base laboratory, but no reports of the findings were made to the division, regimental, or battalion surgeons and therefore no carriers were removed. The presence of diphtheria in this regiment did not come under the attention of the Central Office until it reached its divisional area in April. (The record of this regiment will be completed in a later paragraph because of its late arrival in the division area.)

The 119th Machine-Gun Battalion reached the 10th Divisional Area on March 11. After leaving Camp Merritt, two more cases developed on the transport. These were left at Brest, where they landed on or about March 5. The battalion, after reaching the division area, (March 11), developed four more cases in the first two days. Action was then taken by the Central Office. An epidemiologist, with laboratory assistance, went to the division. The entire battalion, at this time consisting of only Headquarters Company and D Company, comprising 7 officers and 135 men, were at once cultured and Schick tests made. This resulted in the discovery and isolation of 23 carriers (17 per cent of the command) and the immunization of all susceptibles (those showing a positive Schick test). All men were inspected twice daily, their bedding aired, and measures taken to insure the boiling of all mess-kits after meals. As a result of this action taken to control the beginning epidemic in the 119th Machine-Gun Battalion no further cases developed. Results were not always so pretty or satisfactory, however.

This divisional area had never before been occupied by American troops. The resultant necessity of billeting troops in dirty, poorly ventilated barns and stables, with frequent overcrowding, was always an important factor in rendering difficult the control of this disease in these troops already very generally exposed to recent cases.

The 128th Infantry landed at Brest on March 5 and reached the Prauthoy area March 12, the day following the arrival of the 119th Machine-Gun Battalion. Prior to March 10 the only cases occurring in this regiment were confined to Company A of the 128th, with the exception of one case in Company D, which developed on the train between Brest and the Prauthoy area. This case was left at Base Hospital No. 17 when the train passed through Dijon. The 128th Infantry had crossed on a transport in company with the 121st Machine-Gun Battalion, 311th Field Signal Battalion, and 200 casuals. Upon arrival at Brest they were held on the boat three days. After landing, the 128th Infantry was detained in barracks at the debarkation area for two days, where they were quartered with the 127th Field Hospital.

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From Brest they went direct to Prauthoy on troop trains, arriving there March 12. Several cases of clinical diphtheria, which had developed in Company A on the transport, were left at the base port, and five other cases were put off the train at Dijon (Base Hospital No. 17) on the night of March 11. One of the latter cases died during the night of March 11.

In order to check this epidemic, work was begun March 13 on Companies A and D (the companies known to be the worst infected) by special personnel sent out from the Central Office. The active cases were at once sent to Dijon (Base Hospital No. 17). All carriers were withdrawn as soon as diagnosed and placed in Camp Hospital No. 10 at Prauthoy. Then, after all susceptibles had been immunized with antitoxin, it was planned to extend the work to the other companies previously exposed. However, while working with Companies A and D, cases of diphtheria developed in Headquarters Company, Companies G, K, L, and M, and in the personnel of Field Hospital No. 127 then operating Camp Hospital No. 10, so the plan was at once extended to include the culturing and Schick testing of the entire personnel of all companies in the regiment. The Schick reaction was read at 24 and 48 hours periods. All persons showing a positive reaction were given 1,000 units of antitoxin. Cases with suspicious throats were sent to Base Hospital No. 17 immediately after culturing. Cases with positive throat cultures showing no clinical symptoms were considered as carriers and sent to Field Hospital No. 127 (then operating Camp Hospital No. 10, the Area Camp Hospital). The work was interrupted when the division received orders to move to another area. As a result Companies E and F did not get cultured or immunized. These companies, however, had been isolated from the rest of the regiment for twelve days in a separate town. No suspicious cases occurred in them. Company C was not immunized because of orders to depart before the Schick tests could be read. This epidemic was apparently under control on March 23, no new cases having developed in any company up to that date, after it had been cultured and immunized, except as follows: One new case each occurred in the Medical Detachment of A Company; Band Detachment of B Company; D Company; and L Company. The contacts of each case were immediately isolated and cultured. No secondary cases developed to any of these. D Company, however, was entirely recultured, owing to the uncertainty of having reached all the contacts of this case. The special officer was now brought back to the Central Office. A sanitary corps officer with a mobile laboratory was left there to complete the work of releasing the 145 carriers still held at Field Hospital No. 127. Only four of these persisted as chronic carriers. These four were transferred to Base Hospital No. 17. The

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others were returned to duty with their commands. This investigation between March 13 and 23 required 2,446 throat cultures and 1,726 Schick tests. It resulted in the diagnosis of 56 cases of diphtheria (20 in Company A, and 18 in Company D, the rest being scattered in five companies) and the detection of 161 carriers (8 per cent), while 237 healthy contacts (13 per cent) with positive Schicks were immunized. The subsequent history of this regiment was very satisfactory, as there were never more than occasional sporadic cases among its personnel while in France. The additional cases in the 128th were as follows: A Company had another case May 21. E Company had one case May 1 which led to finding one more carrier in the regiment on May 4. F Company had one case May 16. G Company had one case May 31. 128th Machine-Gun Company had one case April 28. (NOTE: E and F Companies had not been immunized.)

Almost immediately after the completion of the work with the 128th Infantry the 127th Infantry began to arrive in the Prauthoy area from Bordeaux (April 10), where, as already stated, they had been held several weeks, during which time quite a number of cases of diphtheria had occurred. The same day (April 10) that the 127th arrived in the Prauthoy area, 5 more new cases of diphtheria occurred in G Company. The divisional laboratory began to culture Companies G, I and L, in which practically all the previous cases had occurred, as soon as these companies arrived in the divisional area. All carriers were removed to Camp Hospital No. 10 as soon as discovered. Unfortunately, all the other companies of the 127th had been more or less exposed to the cases in G, I and L Companies, en route. In addition, upon arrival in the divisional area, F Company (having no previous cases) had been placed in the same town with G Company, while I and L Companies were placed in another town with K Company (like F Company, uninfected). The work was continually handicapped by the assignment to the regiment, from time to time, of small groups of replacements who had been exposed to diphtheria, thus frequently reintroducing the disease. Knowing that diphtheria had been giving considerable trouble in the regiment at Bordeaux, together with the experience we had already had with the 128th, extensive laboratory work was begun at once. The divisional laboratory was reënforced from C. M. D. L. and an epidemiologist from the Central Office placed in charge of the work. The record of the work performed, as well as the subsequent case development in the regiment, can best be appreciated by discussing the companies by groups according to the way they were billeted (and consequently exposed to each other) rather than in alphabetical order.

Companies F and G were billeted in the same town. Both companies

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arrived in the town on March 10. In G Company 5 cases developed on the 10th and 3 on the 12th. The entire company was cultured on the eleventh day by the divisional laboratory and 11 carriers withdrawn. One new case occurred on March 24 and the final one on the 28th. The company was again cultured and, in addition, Schick tested on the 30th. Eleven more carriers were withdrawn and all with positive Schicks immunized. F Company, having been free of cases so far, developed one case on the 15th, five days after entering the town with G Company; 194 cultures were taken and nine carriers found. Another case occurred on the 27th. The entire company was recultured and, in addition, Schick tested on the 28th. Four more carriers were found and all men giving positive Schicks immunized. One more case, the last in this company, occurred May 2. His culture and Schick test had been negative on April 29.

I and L Companies, which, like G Company, had a history of numerous recent cases of diphtheria among their personnel, were placed in a town with K Company. I Company had another case on April 17. Cultures taken at that time located only one carrier. Another case developed April 20 and 3 more cases April 25. The entire company was recultured and Schicked on the 26th. Two cases and 6 carriers were found, and cases showing positive Schicks were immunized. One case and 4 carriers came from the same billet. L Company, which had been cultured on arrival, April 10, had one case on April 21, 3 cases on the 22d and 2 cases on the 26th. The entire company was recultured and Schicked on the 26th. Thirteen carriers were found and men with positive Schick reactions were immunized. A final case developed on May 2. K Company, previously free, developed no cases until May 27, and only one case occurred at this time. Sixteen contacts were examined but no carriers found. No subsequent cases occurred. Attention is called here to the fact that, while the withdrawal of carriers did not check the spread, reculturing associated with immunization of susceptibles did in each case.

A, B, C and D Companies developed no cases. Six carriers were found in following up contacts with cases in other companies.

Headquarters Company had 2 cases on April 13. Six carriers were found among the contacts. One more case occurred May 1. One carrier was found among the contacts to this case.

The 127th Machine-Gun Company had one case on April 24 and 2 cases on April 26.

The Division Intelligence School Detachment of the 127th Infantry had one case. When this case developed in the Intelligence School on May 7, 32 contacts were cultured and Schicked. One soldier from

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the 126th Infantry, whose Schick test and culture were both negative on May 9 at the school, developed diphtheria on the 11th after returning to his regiment. His 13 contacts were cultured and Schicked. One other secondary case developed on the 13th and was similarly handled, except that, since the division was moving to Alsace, the 15 contacts of this case were left with a medical officer, a cook and two weeks' rations. They rejoined the division later. This work of the Central Office with the 127th extended from April 13 to May 3. It required 913 cultures and 1,051 Schick tests. It resulted in the discovery of 14 clinical cases, 22 carriers, and the immunizing of 224 susceptibles.

The division moved into the line near Belfort, Alsace, on May 14. From this time on until July 22, when the division was relieved and ordered to Chateau Thierry, where it arrived July 29, there was some diphtheria constantly occurring in the division. The cases, however, were sporadic. The 32nd Division had 21 cases of diphtheria during May. During their stay in Alsace the portable division laboratory, which had joined the division on April 5, handled all the required cultures without outside laboratory aid. After July 18 the epidemic had largely disappeared (only a case every few days). The divisional laboratory reported only 3 throat cultures in August, and 21 in September, as contrasted to 789 in July, and 2,202 in May.

While holding the sector of the line in Alsace it became necessary to devote a field hospital to contagious diseases and concentrate all diphtheria cases there. The divisional laboratory was stationed at this hospital. This plan was adopted after finding a moderate increase of cases in the latter part of May resulting from the partial loss of early control of contacts with fresh cases, due both to the confusion of moving into a new area and to the fact that they had depended at first on a French hospital which failed to notify the division as soon as a case of diphtheria was diagnosed.

The other regiments of the 32d Division were practically free at all times from diphtheria. The 125th Infantry had 4 cases between May 25 and 29. The 126th Infantry had 8 cases between April 24 and May 25. These were promptly controlled by both the withdrawal of 15 carriers found among the contacts and the immunization of susceptible individuals among those who had been in any way exposed to these cases.

In looking back over the ravages of diphtheria in this division there are two striking points where improvements could have been made in control. Both occurred in the 127th Infantry. First, the work done at Prauthoy should have been done in the three weeks while the regiment was held at Bordeaux. Second, if the first culturing of each com-

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pany by the divisional laboratory men had been associated with immunization, as in the case of the reculturing, it is highly probably that the extensive reculturing would not have been necessary.

Diphtheria in the 35th Division

The other big problems offered by the presence of diphtheria among troops in the field was in the 35th Division. This was similar but less acute than in the 32d, not epidemic, but widely scattered, dribbling cases. It required, however, almost constant attention for four months (June to September, 1918, inclusive) before it reached a point where it was no longer dangerous. This division had a number of cases at Camp Doniphan prior to leaving the United States. One report says: "Many cases each week." Diphtheria became more prevalent during the ocean voyage. On arrival in England the division stayed there some time, and cases of diphtheria began to appear in considerable numbers. The outbreak from the very beginning was one which did not limit itself to a single organization, but showed a wide scattering of foci of infection. Thus, in the week ending May 29, there were, according to British reports, 27 diphtheria cases distributed as follows:

137th Infantry, 1st Battalion	1
3d Battalion	1
138th Infantry, 3d Battalion	1
139th Infantry, Headquarters Company	3
1st Battalion	3
2d Battalion	3
3d Battalion	2
Machine-gun Company	1
140th Infantry, 1st Battalion	2
2d Battalion	6
110th Engineers	4
Total	27

The same was the case for the week ending June 5, only the incidence of cases was slightly diminished.

On June 5 the division was again crowded on trains for two days and moved to an American area in France. On June 12 cases began to increase, and in the same scattered manner as in England. Between June 12 and 17 there were 20 cases, not more than 2 being in any one company.

Owing to the scattered nature of the cases and the fact that the division was to move again the next day, such extensive work as has been described in the 32d Division was, at least for the present, out of the question. Consequently, 30 to 40 immediate contacts with each case were cultured, 483 cultures in all being made. These resulted in the withdrawal of 7 carriers. No Schick tests were done, for even if they

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could have been read during the move (which was unlikely), antitoxin could not safely have been given on the trains.

The division moved into the 3d Army Corps and was given a sector of the front in the Vosges Mountains to hold. The troops were distributed both in billets and dugouts. The sector had a 20-kilometer front and an area of 500 square kilometers, which complicated any attempt at control but which also diminished any chance of contact between organizations larger than companies.

The method of control adopted here was that of culturing and Schick testing all immediate contacts while in the front-line dugouts, and then systematically examining the entire company when brought out into rest billets at frequent intervals. This laboratory work, while in the Vosges sector, was done by a mobile laboratory and two officers, assigned temporarily to the division by the Central Office. The laboratory reached the division on June 29, just as it was taking over the sector. No time, except that required by the move, was thus lost in following up the preliminary work done just before they were ordered to leave the back area. Twenty-eight cases occurred between July 1 and August 12 while in this sector. They were distributed as follows:

137th Infantry: Total of 17 cases (14 arose while in dugouts). C Company had 6 cases while in the trenches. The entire company was cultured when it came out of the trenches into rest, and 6 carriers were withdrawn. Two more cases occurred four days later. The company was recultured and Schicked. Three more carriers were found.

138th Infantry: Total of 6 cases. B Company had 2 cases. These were reported very early with only slight sore throat. All contacts had negative cultures. No further cases developed. In E Company 4 cases occurred while in dugouts. The entire company was cultured when relieved, and 10 carriers were withdrawn. No subsequent cases developed.

139th Infantry: D Company had 3 cases while in the trenches. No carriers were found in the immediate examination of contacts, but 3 were found later on examination of the company after being relieved from their turn in the trenches.

On August 14 the division was again moved. The division's portable laboratory, now the only laboratory with the division, was packed up and never again reopened until after the armistice. Prior to the Meuse-Argonne offensive the laboratory was stored at the Army Supply Depot at Vaubecourt. During this time, although urgently needed to examine immediate contacts, it was unavailable. Over 50 cases of diphtheria occurred in the division between August 14 and September 2. The cases, however, seemed to be diminishing by the middle of September prior to the Argonne offensive, in which the division was one of those

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starting the attack on September 26. Oddly, during these last two weeks of August, most of the cases were occurring in one company of the 139th Infantry. This company had been completely cultured twice and Schicked, besides being subjected to daily throat examinations and iodine swabbing.

The general situation of diphtheria in the American Expeditionary Forces, just between the time it had been quite well controlled in the divisions during the second period and before the problems again manifested itself during the third priod (the period of active fighting), in the hospital centers, is well shown in a letter quoted in its entirety:

FRANCE, 3d *August*, 1918.

From: Chief Surgeon, A. E. F.: S. O. S.
To: The Director of Laboratories, A. P. O. 721.
Subject: Diphtheria.

1. Of 95 cases of diphtheria reported since July 21, 20 occurred in troops in England recently arrived at Base Port. Of the remaining 75, 66 occurred in Infantry, Field Artillery and Engineering regiments, and in Hospital Organizations according to the accompanying lists, and the remainder scattered in other organizations in various parts of France.

It is evident from a glance at the list that, atlhough, the great majority of the cases developed in and were received from organizations taking part in the recent and continuous active operations at the front, there is no such grouping of cases as would justify any study of the conditions in the field with the view of detecting sources of infection or controlling carriers.

It is not recommended that any effort be made from your office to assist the Field Organisations at present, so far as concerns the incidence of diphtheria.

By direction:

(Signed) HAVEN EMERSON,
Major, M. R. C.

During the third period which covered our active operations, extending practically from the time of troop concentration prior to the St. Mihiel offensive through the subsequent Meuse-Argonne offensive, the presence of diphtheria was no longer of great concern to any combat division. Cases were at once evacuated even before confirmation of the diagnosis in a suspicious case. As a result, diphtheria began to manifest itself in the hospital centers of the S. O. S. The control of diphtheria in the hospital centers was taken care of by the center laboratories and in no case required reinforcements from the Central Office. The presence of diphtheria in a hospital center was a local problem, and, owing to the way it was handled in each incidence, never became a general A. E. F. problem, as in the case of the 32d Division especially.

Diphtheria in the Mesves Hospital Center

The Mesves Hospital, one of the first to be affected, had an average of about 18,000 patients during the last three months of 1918. Base

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Hospital No. 54 (one of the Mesves Center hospitals) found that 1 per cent of its cases during October were due to diphtheria. During this month only 3 cases had occurred among nurses and 2 cases in the enlisted personnel of Base Hospital No. 54. In the first half of November, however, this hospital had 16 cases originate within the hospital (among patients and personnel) out of a total of 34 cases occurring in the entire center. This outbreak occurred coincident with the maximum period of overcrowding in the wards and overwork of its personnel. The following regulations in force at the center proved inadequate to prevent the outbreak in November:

(*a*) Culturing of every suspicious throat that was seen for any reason.

(*b*) Immediate transferring of cases that were positive either clinically or culturally and also detected carriers, to a special ward in Base Hospital No. 50. In this ward all the attendants were masked and isolation enforced.

(*c*) Culturing all contacts of cases. All other patients in the same ward where a case developed were considered contacts. This work was done by the sub-laboratories attached to each base hospital. From November 1 to November 13, inclusive, 652 cultures of this kind had been made by the sub-laboratory of Base Hospital No. 54.

(*d*) All carriers and cases were held in Base Hospital No. 50 until three successive negative cultures at 48-hour intervals were obtained.

(*e*) All the personnel of Base Hospital No. 54 had been cultured for possible carriers.

(*f*) Boiling of mess-kits, and dishes after each using.

(*g*) A careful spot map had been kept showing the exact place where each case had developed in the hospital center.

The following additional regulations were found necessary before the epidemic was controlled.

(*a*) Contacts (the whole ward) were to be given the Schick test as well as cultured. Positive Schicks were to be given immunizing doses of antitoxin (the whole ward was taken as a unit of contacts as other methods of determining contacts were considered too inaccurate for use in hospital wards).

(*b*) Every attendant of diphtheria was to have a negative Schick.

(*c*) All culturing, etc., in this work was to be done directly by the center laboratory and not by the sub-laboratories of the hospitals. This will have the result of rendering the whole work entirely systematic.

(*d*) Daily inspection of the throats of all physicians, patients, nurses and enlisted personnel of Base Hospital No. 54.

During the operation of the Mesves Center, from October 1, 1918, to February 1, 1919, the control of diphtheria required 16,636 throat cultures, 782 of which were positive.

Diphtheria in the Allerey Hospital Center

The presence of diphtheria in the Allerey Hospital Center also created quite a problem locally. The first case occurred September 24, 1918. Two more arose October 1, another on the 5th, one on the 8th, three on

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the 9th, and so on until, from November 10 to December 8, the hospital reported from one to seven new cases daily. This hospital center consisted of the typical one-story wooden barracks covering an area of one square mile. It was handling over 17,000 patients at a time with 3,000 personnel. Considerable overcrowding of its wards occurred during October and November. Seventy patients were occupying the normal capacity fifty-bed barrack at the time of the outbreak of diphtheria. Many of the cases early in the epidemic were in patients evacuated as "gassed." This often resulted in delayed diagnosis, since a sore throat or even a membranous condition in a gassed case, certainly early in the epidemic, was not regarded with the same suspicion as in a normal case because the condition was commonly assumed to be a result of the gas irritation. This resulted in letting the epidemic get fairly well under way before its extent was suspected. As soon as the case incidence began to assume epidemic form, systematic laboratory investigations were made to locate and isolate all carriers.

In Base Hospitals Nos. 25, 26 and 49 (also belonging to the center) several nurses and hospital corps men were picked up as carriers, who had been known carriers in the States but who had been previously released on three negative cultures and sent overseas.

In Base Hospital No. 25, 75 carriers were found; 33⅓ per cent of these gave a history of being gassed, while out of the 35 clinical cases in the hospital only 5.7 per cent had been gassed.

The entire epidemic required 13,284 cultures, of which 246 were positive. The success of the work in controlling this epidemic was attributed largely to success in obtaining early diagnosis with the immediate isolation of cases, suspects, and contacts. The extensive culturing of wards which was adopted in the search for carriers brought out a danger to be guarded against in this sytem. It gave some at first a false sense of security and led them to be lax in enforcing regulations like the use of a face mask and other such measures commonly employed. The search for carriers was confined to examination of the contacts of each fresh case (this included the entire ward or barrack where the case arose). It would have been useless to have cultured the entire center as this would have taken eight days, since the incubator space was limited to 2,000 cultures daily. Only 1,363 Shick tests were done, owing to a temporary shortage in the toxin supply. However, out of these, three of the hospitals showed 8 per cent positive, one 6 per cent, and one only 6/10 of one per cent respectively. The small percentage in the last hospital indicates a flaw probably in the technique of interpreting the reaction and emphasizes the importance of uniformity in administering and reading the Schick test.

(*To be concluded*)

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AN OCCURRENCE OF RAPID ABSORPTION OF CATGUT SUTURES—IN THE LIGHT OF A POSSIBLE BALANCE EXISTING BETWEEN DIGESTION AND ENCAPSULATION PROCESSES IN THE ATTACK UPON A FOREIGN PROTEIN

By NORVELLE WALLACE SHARPE, M.D., F.A.C.S.[1]

I

AT THE Post Hospital, Carruthers Field, in November, 1918, Private J. D. L. was transferred from the medical service to my service with a tentative diagnosis of appendicitis. This was confirmed by examination which found a painful appendix, somewhat obscurely outlined, moderately enlarged in diameter, apparently less than 8 cm. in length. It seemed probable that it was retrocecal. Neither the general nor local condition seemed critical; and as orders had but recently come through from the Surgeon General countermanding all operative work save that of urgency, the patient was put on the Ochsner regime and kept under observation. Improvement was steady, the acute syndrome disappearing within 50 or 60 hours.

By this time study of the antecedent history had developed the facts that for the past ten or twelve years the patient had had more or less constant (and frequently acute) gastro-intestinal indigestion; his appetite was habitually capricious, ranging from almost complete anorexia to pronounced voracity. His strength averaged definitely below par; bowel movements were irregular, with tendency to constipation. He was nervous, anxious, and somewhat irritable, his skin surprisingly clear, tending to the ruddy type. He was distinctly discouraged regarding his personal efficiency, realized his physical inadequacy, and desired relief. The question of precedent appendix outbreaks could not be absolutely determined from the anamnesis, but it seemed highly probable that a long-standing, low-grade appendicitis was *l'agent provocateur*. Operation was determined.

When section was made, the visceral and parietal peritoneal layers were found adherent over ileum, cecum, and proximal colon. In this vicinity neither small nor large intestine was visible, both being thoroughly encapsulated by the densest Jackson's membrane that it has been my fortune to encounter. Removal of this membrane proved both tedious and time-consuming. Numerous substantial varicose

[1] Late Captain, M. C., U. S. A.; assigned with Air Service Division of Military Aeronautics.

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vessels were encountered; calibers up to 3 mm. were not rare; dense adhesions were widely disseminated. The appendix was found retrocecal, moderately enlarged, harboring one or two small concretions, intensely engorged. Routine removal followed, and the thankless task of covering numerous abraded areas, developed by the dissection, completed. The intermuscular abdominal wound was closed, without drainage, in tiers, including silkworm gut right-angled tension sutures, and a subcuticular No. 3 catgut tier.[2]

The next three or four days proved somewhat stormy; moderate tympany, abdominal griping, and vomiting were in evidence. Routine measures of relief proved adequate. The patient's complaints of discomfort and pain were grotesquely disproportionate to the actual physical status.

Thinking that possibly the prolonged and repeated straining had somewhat impaired the wound fixation, the patient was ordered for dressing on the fourth day. Inspection showed complete diastasis of the skin and superficial fascia ranging up to 10 mm.; and doubtless would have been greater save for the unimpaired support afforded by the tension sutures. The subcuticular catgut suture was practically completely digested; nothing remaining save an occasional attenuated fragment and the terminal knots, and even these were in a state of slimy disintegration.

Without anesthesia, an over-and-over catgut tier suture was introduced, including skin and subcutaneous fascia. By an odd error my nurse supplied me with a double No. 3 catgut suture.[3] This (to avoid delay) was employed without alteration. The tension sutures were removed, and smooth re-apposition of skin and superficial fascia was secured. Nothing of significance followed. Examination of the dressings on evening rounds of the fourth day showed a moist stain over the wound. Redressing the next morning (fifth) revealed complete digestion of the double catgut through-and-through sutures had taken place. At this time, as sundry tissue bridges had formed, the Carrel-Dakin sequence was established, and further progress ceased to be significant.

SUMMARY

1. Digestion of No. 3 catgut subcuticular suture noted morning of fourth day.

2. Digestion of double through-and-through No. 3 catgut suture noted morning of fifth day.

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[2], [3] This also has been recorded from memory; it is safe to say that it was not smaller.

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II

We have sadly lacked definite data regarding the action of enzymes, but some experimental studies[4] which I have been privileged to share with Professor Pohlman, extending over a period of three or four years precedent to service with the colors, would lead to the conclusion that a substantial amount of a foreign protein, introduced within the tissues, is digested *in situ;* that non-digested particles, and those partially digested, are transported to, and ultimately through, the lymphatic channels.

In brief this series of experiments tends to show the existence of at least three definite processes associated with the absorption, or other disposition, of an alien proteid: (1) the development of a proximal digestion zone contiguous to the foreign body (lymphoidal cells); (2) of an intermediate zone (largely endothelial leucocytes); (3) of a distal encapsulation zone (constructed by fibroblasts).

Proceeding centrifugally, it has been observed that the digestion cells (lymphoidal) apparently attack the foreign protein by means of enzymes and appear to be stimulated by the end products of digestion; that the intermediate cells (endothelial leucocytes) appear to serve solely as carriers, and that they penetrate through the zone of encapsulation, transporting undigested particles into the lymphatic stream; that the cells of the zone of encapsulation (fibroblasts) seem to be inhibited in the production of definite scar tissue by the seepage of digested material, produced by enzymic action of the lymphoidal cells of the digestion zone upon the foreign proteid.

Or, phrased somehwat differently, we have found that the more readily an alien protein is digested, the more rapid is such digestion; because of apparent stimulation of digestion cells, the more readily an alien protein is digested the greater the inhibition to encapsulation processes; *per contra* the more the encapsulation process is inhibited the more free will be the circulation and transportation of digested material and this in proportion to the relative fenestration of the interposed barriers.

III

In the absence of carefully stained serial sections of the operative field as herewith presented, extending from the point of insertion of the sutures up to, and including, lymphatic channels, and furthermore assum-

[4] These studies are, as yet, incomplete; hence we are not prepared to submit final conclusions. We are, however, willing to submit the following notations which developed as a by-product in the consideration of our primary problem. To our minds the clinical phenomena recorded in Section I correlate with our laboratory findings in a fashion that is highly suggestive and stimulating.

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ing that the catgut employed differed in no essential from that furnished my service, we are hardly justified in affirming more than the statement that in this instance an unusual biochemic status existed which produced digestion phenomena more intense and more rapid than normal.

But had time and occasion and facilities warranted, it would have been an interesting study to have tested the enzymic reactions of this man to other alien proteins; likewise to have permitted him the task of digesting autogenous sutures.

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A NEW APPLIANCE FOR "FLAIL" ELBOWS

By FRANCIS S. CHAMBERS, M.D.
Late First Lieutenant, Medical Corps, United States Army

(With eleven illustrations)

DURING the late war there were a number of severe gunshot injuries of the elbow joint, accompanied by extensive comminution of the bones forming this articulation. In many instances the fragments, including the articular surfaces of one or more of the bones, have been removed. Frequently the resection has included several centimeters of the shaft of the humerus, and, although at times done subperiosteally, there has often been little or no regeneration of bone in the months following. While in some cases lives have been saved and amputations avoided by such radical procedures, "flail" elbows have usually been the final result.

On the other hand, civil surgery occasionally gives us instances of "flail" elbows (*i. e.*, following radical resections of the elbow joint). Such mutilated joints have been a great handicap, and to obtain satisfactory function in such cases is a problem.

During my recent service at the Walter Reed General Hospital there were several cases of "flail" elbows, and the opportunity was afforded me to design an appliance which has given satisfactory results —in fact, far better than was at first expected.

All of the cases were of the same type, characterized by loss of the capitellum, trochlea and part of the shaft of the humerus. The loss of bone is shown by Figs. 1, 2 and 3 better than words can describe. Two cases have been selected for purposes of demonstration; one has been under observation for a few months, and the other was admitted to the hospital a few weeks ago.

Voluntary flexion is not often possible if there is considerable loss of the shaft of the humerus. If the loss of substance is not too great, the end of the humerus may act as an imperfect fulcrum and a certain amount of flexion be thus obtained, and then as a rule only when the arm is steadied in a certain position. Sometimes flexion causes pain. This is due to the fact that the intervening tissues are compressed between the forearm bones and the end of the humerus, and the pain is especially marked if the latter is somewhat sharp (see Fig. 1).

When flexion is attempted, the ulna and radius are drawn upwards, and often by the time the bones have reached the end of the humerus the muscles have expended their maximum effort, and there is little or no power left in them to continue the movement. Besides, the

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triceps sometimes contracts and the flexors are compelled to overcome this added resistance.

However, if a fulcrum be supplied, a certain amount of flexion will be obtained. Fig. 4 illustrates the maximum voluntary flexion possible in Case No. 1. The prominence made by the head of the radius can also be seen. By placing the thumb of the right hand (left hand for right arm) above and a little in front of the head of the radius, and the index finger above the inner lip of the articular surface of the ulna, we can supply this fulcrum (see Fig. 5). To execute this maneuver, the grasp above the bones is gentle and moderately firm; downward pressure is made with the hand, just enough to counteract the upward displacement, and at the same time the hand is allowed to rotate as flexion progresses.

In the appliance, the pressure of the thumb and the index finger is replaced by the fulcrum pads (see Figs. 6 and 7). They are shaped like an inverted "L" and make pressure above and in front of the head of the radius and inner lip of the ulnar articulation. The pads are sewn on metal and are sufficiently thick to prevent the uncovered portion of the metal from pressing on the skin over the bones. The pads in the apparatus, shown in Fig. 6, are mounted on an aluminum collar, the ends of which are specially shaped to receive them. This collar must be stout enough to hold the pads in position and prevent the apparatus from spreading when flexion is attempted. In the other model, which is the better, the forearm band *B* (Figs. 3 and 7) is made of aluminum and serves the same purpose.

The metal carrying the pads is rigidly riveted to two hinged flat bars, placed on either side of the arm just below their hinges. By having the pads fastened to the bars below the hinges they must move with the forearm and thus maintain the same relations to the ulna and radius at all times. The bars above the hinges lie on the sides of the arm and are attached to a leather cuff, which encircles the arm just below the axilla *E* (Figs. 6 and 7), the upper edge of which is covered with a fold of chamois where it bears against the axillary folds during flexion. They maintain the length of the arm during flexion and prevent the dragging upwards of the forearm bones. The pads being "L" shape, as stated above, the horizontal portion receives the upward pull of the ulna and radius during the early stage of flexion and, as the movement progresses, the pads turn with the forearm, and the descending portions then come to lie superiorly and act the same way. Also, the forearm band *B* (Figs. 3, 6 and 7) helps to maintain the proper relations of the forearm.

In the second appliance (Fig. 7), the forearm band being made of

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metal and rigidly fastened to the side arm, the patient first passes his arm through the axillary cuff and then adjusts it to his arm from the front. In the other, where the collar embraces the elbow posteriorly (Fig. 6), the appliance is put on from behind and the forearm band *B* consists of a tape and buckle.

The terminal band *F* (Figs. 6 and 7) is riveted to the forearm bands and holds them in relation to the forearm. By placing a strap and buckle posteriorly close to the elbow *G* (Fig. 7), backward displacement of the ulna and radius is prevented when flexion begins. The hinge joints of the side bars must be parallel and even with each other—this is important. The bars may, however, be bent to conform to the shape of the arm at other points. The hinge joints must also lie directly above the ends of the bones about one-half inch. The mid-axis of the arm lies more anteriorly, but, if the joints are placed in front of the bones, the brachialis anticus and the biceps will lose their leverage.

The appliance is not difficult to make. The flat-hinged bars can be obtained from the supply houses; they should be light and rigid. The portion intended for the arm should be made long enough to reach from the elbow almost to the axilla; the leather cuff will complete the distance. It has been found best to have the upper edge of the axillary cuff about half an inch below the axilla. The forearm rods should extend almost to the junction of the middle and distal thirds of the forearm.

The fulcrum pads must be made carefully. Patterns are obtained by first marking on the skin the areas where pressure is desired. Thin paper is placed over the markings and the outlines traced. They are then cut out, and the patterns thus obtained are used in shaping the pads. With the forearm in the same axis as the arm, the upper edge of the head of the radius and the inner lip of the greater sigmoid of the ulna are marked. At the anterior extremities of these markings a line is drawn downwards about 1 to 2 cm., in front of the bones. The tip of the olecranon is the point of the upper limits of the pads. This must be on the same level on both sides. The radial pad can extend a little posteriorly to the bone, but, if the ulnar pad is carried too far back, the pad, when completed, might make pressure on the ulnar nerve.

With the arm and the forearm in the same axis, it will be found that the lower border of the radial pad is below that of the ulna. With the forearm and arm in this relation, the head of the radius is a little below the level of the inner lip of the greater sigmoid. If it is desired to retain the "carrying angle," the lateral flat bars of the forearm C should be bent outwards just below the hinges, and, in marking the position of the pads, the arm should be held in the position desired. It will be found that the lower borders of the markings for the pads will then be on the

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same level. However, there is not much to be gained by providing for the "carrying angle" in these cases. The hinges are placed equal distances below the superior borders of the respective pads, and for this reason it is necessary to have their upper margins on the same level.

Two pieces of sole leather are cut out, using the patterns obtained as mentioned; the desired thickness of felt is added and the whole covered with chamois. They are three-eighths to five-eighths of an inch thick. The completed pads are sewn with waxed thread to pieces of metal, which are bored to receive the stitches (see Figs. 3, 6 and 7). The "L" shape of the pads will leave a portion of the metal pieces uncovered, and this area is used to receive the rivets for attachment to the side bars. The pads are made sufficiently thick to make the desired pressure and at the same time prevent the uncovered metal from pressing on the skin. Aluminum is a good material to use, as it is easily bent to conform to the contour of the elbow.

If it is desired to mount the pads on a collar (Fig. 6), it is cut out and made to follow the contour of the elbow posteriorly and the ends shaped to receive the pads. However, the other model, shown in Fig. 7, is better, and the one shown in Fig. 6 has since been changed; that is, the collar cut off and a metal forearm band *B* added. The following remarks will apply to this second model.

The pieces carrying the pads are firmly riveted to the forearm bars, taking care to have the hinges on the same level with each other, about one-fourth inch below the upper border of the pads.

The forearm band *B* is next made. Aluminum sheeting one-sixteenth inch thick, folded double, is suitable; it should be 1¼ inches broad and the upper border is placed 1 cm. below the crease of the elbow. It is bent to conform to the shape of the forearm. With the band held in place, temporarily place the fulcrum pads and flat bars in position with the arm extended, so that the bars lie flat on the forearm beneath the band *B;* at the same time bend them to the contour of the forearm. The side bars *C* and the band *B* are marked, then rigidly riveted together and the excess of the latter trimmed off, etc. Temporarily the hinges will not be parallel, but by subsequently twisting the bars *C* the proper relations will be restored.

While the bars are held in position, the terminal forearm tape *F* is placed around the forearm and marked at the points where it is to be riveted to the bars *C*. Place the buckle posteriorly. Likewise, a piece of paper encircling the arm just below the axilla is marked to give the dimensions and points of attachment of the axillary cuff to the flat bars *D*. The cuff is about 2 inches wide and the smooth side of the leather placed against the skin. It can be laced, but it is preferable to employ

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tape and buckle. The buckle should be placed externally where it is more readily reached by the patient. As already stated, the distance from the upper edge of the axillary cuff to the elbow should be about half an inch less than that from the axillary folds to the same point.

The apparatus can be completed without further description by referring to the illustrations. If accurately made, it stays in place, the fulcrum pads preventing it from sliding down on the arm and the axillary cuff preventing upper displacement. It is comfortable.

The pressure of the fulcrum pads causes no inconvenience. Case No. 2 has been wearing an apparatus of this design for nearly three months and up to the present time has experienced no discomfort. In Case No. 1 the scars are unfavorably placed and will need watching, although, after wearing the appliance two weeks, there has been no difficulty. When it is recalled that many amputés bear weight on the scars of their stumps, with a little care the moderate pressure of the fulcrum pads should cause no trouble.

Too much must not be expected when the appliance is first tried, for usually there is considerable muscular atrophy due to lack of use. The brachialis anticus and biceps are especially weak, and the brachialis radialis will also be impaired in proportion to the amount of loss of the external epicondylar ridge from which it derives a great part of its origin. Abduction of the shoulder is not often attempted, owing to the lack of lateral stability of the elbow, and marked weakness of the rotators inserted into the tuberosities of the humerus, as well as the deltoid, is to be expected.

Massage and electricity should therefore be employed, and, above all, special exercises and a few points regarding the latter deserve mention. These exercises at first must be assisted, for, added to the muscular weakness, there is also a loss of "muscle sense." So, often the initial attempts at flexion are accompanied by general spasmodic contraction, which includes the triceps as well as the flexors. Flexion exercises are executed by using the thumb and index finger to supply a fulcrum (Fig. 5). For the right elbow, the left hand is used, and the forearm is supported with the right. For the left elbow the hands are reversed. Abduction and movements of rotation of the shoulder are also assisted by holding the arm in one hand and the forearm in the other, with the elbow bent at a right angle.

Pronation and supination will frequently be found impaired by fibrosis between the head of the radius and the lesser sigmoid cavity of the ulna. Passive movements must be employed carefully to break up adhesions; the one hand holding the bones at the elbow, and the movements being executed with the other. Swimming with the appliance

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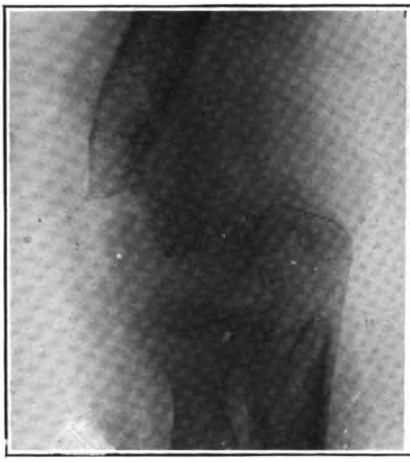

FIG. 1.—Case No. 1, wounded at St. Mihiel, Sept. 17, 1918, by high explosive. Debridement with removal of bone fragments Sept. 20, 1918; wound healed March, 1919. Admitted to Walter Reed Hospital, July 23, 1919

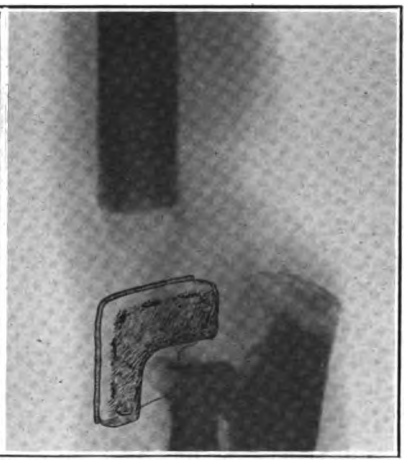

FIG. 2.—Case No. 2, lateral view with forearm rotated to oblique position. Inner side of radial pad sketched in to show its relation to the head of the radius.

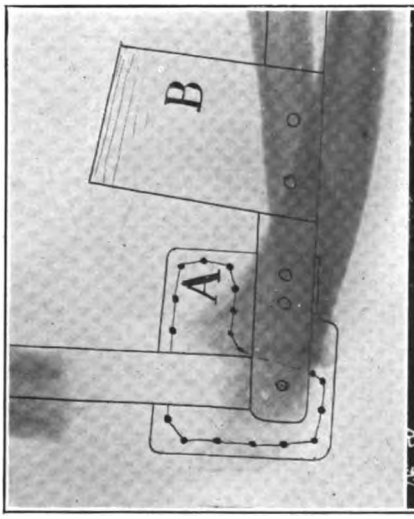

FIG. 3.—Case No. 2, X-ray with diagram of outer half of appliance in position. Outline of fulcrum pad shown by stitch markings, A. Observe that upward dragging of the forearm is prevented by the shape of the pad A, and the forearm band, B.

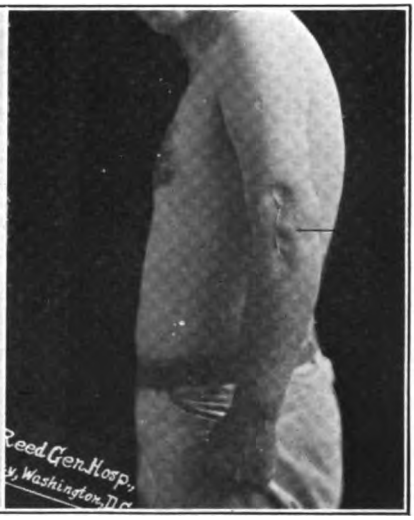

FIG. 4.—Case No. 1, maximum flexion without assistance. A, prominence of the head of the radius. The scars are unfavorably placed and will have to receive the pressure of the fulcrum pads. Forearm and hand are normal; marked weakness of arm and shoulder due to lack of use dating from Sept. 17, 1918.

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FIG. 5.—Case No. 1, showing flexion possible if a fulcrum is supplied. The thumb of the right hand is making firm, gentle pressure just above the head of the radius and the index finger is pressing over the inner lip of the ulnar articular surface. The hand is pressing downwards to prevent shortening of the arm. Flexion about 100 degrees.

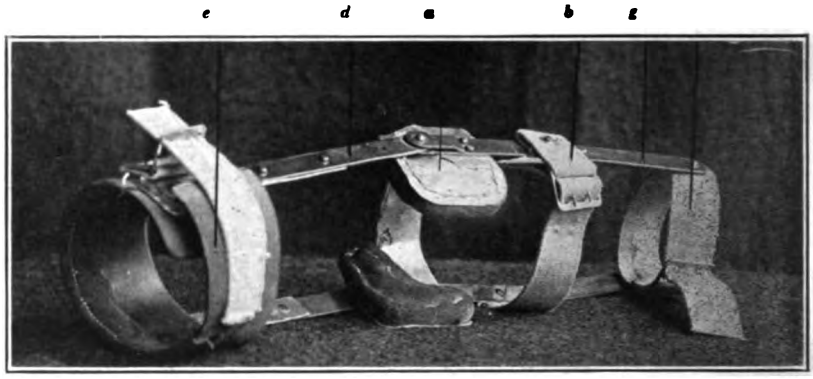

FIG. 6.—FRONT VIEW OF APPLIANCE USED BY CASE NO. 1.

a, Fulcrum pads mounted on metal collar which is rivited to forearm bars, *c*, just below the hinges; *b*, forearm band, buckle and tape (compare with Fig. 7); *c*, forearm bars; *d*, arm bars, it was necessary to piece them to secure the desired length; *e*, axillary cuff—the upper edge is covered by a fold of chamois where it bears against the axillary folds; *f*, forearm tape riveted to the forearm bars, *c*.

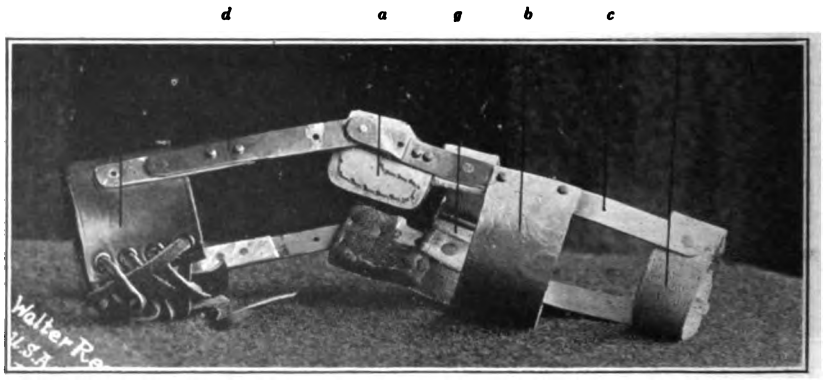

FIG. 7.—APPLIANCE WORN BY CASE NO. 2.

a, Fulcrum pads sewed to pieces of aluminum which are riveted to the forearm bars, *c* (compare with Fig. 6); *b*, forearm band of aluminum which prevents spreading of the appliance during flexion; *c*, forearm bands; *d*, arm bars; *e*, axil ary cuff, laced; the buckle and tape are more convenient, see Fig. 6; *f*, forearm tape; *g*, tape and buckle added, it is necessary when the metal collar is not used. Compare Figs. 6 and 10.

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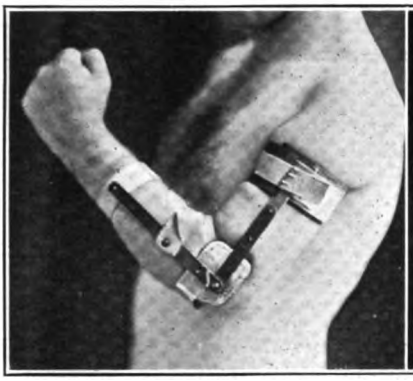

FIG. 8.—Case No. 1. Voluntary flexion to 90 degrees after wearing the appliance two days. Appliance shown in Fig. 6.

FIG. 9.—Case No. 2. Wounded July 20, 1918, at Soissons. Subperiosteal resection of lower extremity and several centimeters of the shaft of the humerus at a French hospital. No drainage. Improvement following three months treatment. On admission, voluntary flexion was nil. Note that there are no skin disturbances due to pressure of the fulcrum pads.

FIG. 10.—Case No. 2, wearing appliance shown in Fig. 7. Note that the metal collar at elbow is omitted and a strap and buckle placed closed to the joint (*g*, Fig. 7), and that the forearm band is made of aluminum.

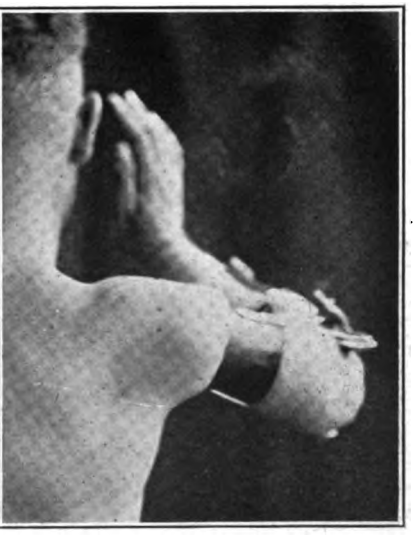

FIG. 11.—Case No. 2, results after three months treatment. Abduction of the shoulder to nearly 90 degrees and flexion of the elbow to 45 degrees.

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on the arm is beneficial, as the water offers some buoyant support and encourages voluntary movement.

Patience is necessary, but the ultimate results will be very satisfactory. During the early days of treatment, a few attempts at voluntary flexion will often leave the flexors completely exhausted. A few months ago, before treatment was begun, Case No. 2 had no voluntary flexion at all, but at the present time he is able to flex his arm a little without the appliance and, in addition to increased strength of his muscles, he has apparently regained better control over their actions (see Fig. 9). With this appliance he can now abduct his shoulder to 90 degrees and, at the same time, flex his elbow to 45 degrees (see Fig. 11). He has fairly good use of his arm, can give a good hand salute, but there is still some weakness of the external rotators of the humerus; further improvement is expected. The first case (see Figs. 4, 5 and 8) demonstrates the results obtained after one week's treatment and employment of the appliance for only two days.

In some of the cases, regeneration of bone, and the formation of new callus on the end of the humerus, will offer mechanical obstruction to the coronoid process of the ulna during flexion; obviously no appliance can overcome this difficulty. It should be added that if the head of the radius and the ulnar articulation are missing, the fulcrum pads must be designed differently; they then should be made oval and placed just above the ends of the bones. The upward dragging of the forearm, after flexion has advanced forty-five degrees from full extension, will be prevented by the forearm band "B" (Figs. 3, 6 and 7).

Needless to say, if the bicepital tubercle of the radius or the coronoid process of the ulna is lost, satisfactory results are not to be expected.

An appliance of any kind is not a good surgical ideal, but is there any operative procedure which can restore, to these patients, better function or give results equally as good as an appliance of this kind.

Permit me to express my thanks to Colonel Glennan, commanding officer of the Walter Reed General Hospital, and to Colonel Keller, chief of the Surgical Staff, for the facilities which they afforded me in studying these cases and perfecting this device. I am indebted to Sergeant Hempel for his assistance in the workshop. The photographs were made by Private Hottman.

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THE WARD SURGEON—HIS RELATION TO RECONSTRUCTION

By Major RICHARD B. DILLEHUNT

Medical Corps, United States Army

IF YOU ask a wounded soldier who his doctor was in France he will almost invariably recall a ward surgeon to whom he is very grateful. Even if he had numerous surgeons attend him during his evacuation from the front, and even though he may have been seen by consultants of great eminence professionally, and of high rank in the service, he will usually remember as having been most important to him and to his recovery, Captain or Lieutenant Somebody, a ward surgeon.

In this respect he is quite right, because it is conceded by everyone who has served in many capacities in the medical service that the ultimate result in a battle casualty is more affected by the judgment, skill and diligence of the ward surgeon than by any other factor. His degree of punctuality and care in carrying out surgical dressings can make, mar or ruin the hoped-for result of a surgical operation. He sees the soldier daily and becomes acquainted with him, and the soldier learns to know his doctor. Thus there is a mutual interest and their relationship becomes close and personal. There is perhaps no other instance in the Army in which intimacy of a certain degree arises between officers and men, not only without impairing the necessary military decorum, but cementing them in a common interest that augments it, as that which obtains between a good ward surgeon and his soldier patients. This relationship is simply an accentuated example of that which is known to exist between doctor and patient in civil practice, only in the military service the patient has no choice, and the ward surgeon goes through a very critical—almost cynical—probationary period with every soldier under his care, and it takes only about seventy-two hours for his standing as an officer and as a doctor to be definitely established. And they are usually correct in their judgment, because they know within that time how much interest he has in his work, and whether or not he goes about it as if he knows what he is doing. This feature offers to ward surgeons one of the most valuable benefits of the military service, namely, practice in making good with an ultra-critical clientele —a feature much overlooked in professional training.

But the object of this discourse is to point out the function of the

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ward surgeon in reconstruction work other than that of a purely medical nature; and it is important.

My first impression of the importance of occupational aides was in France when I found that to go from a ward of unoccupied fracture cases to one in which the aides were accomplishing their work was like going from a boiler factory into a cathedral. It was there also that I saw the efforts of the aides in one ward completely annulled by the cynicism of a ward surgeon, and vitiated in another by a shrug of indifference, but fortunately nearly always happily consummated by an interest in and encouragement of both patients and aides, by the ward surgeon.

I cite this merely to show to what degree the ward surgeon's attitude can influence those soldiers in his care, and to urge the use of this influence in the betterment of the soldier's future by the encouragement of his vocational work and interest.

The mere fact that there are opportunities available, buildings provided, teachers assembled, and machinery and apparatus at hand is not enough to inspire the average wounded man to take advantage of them, particularly if he has been unoccupied over a long period. To supply the incentive, aides and special officers are detailed, and the fruition of their efforts has been astonishing, but if they are able to accomplish so much without the advantage of a personal relation to the soldier for some time, how much more could be done by the ward surgeon who has that advantage?

The ward surgeon who has an intense interest in the physical reconstruction of an individual soldier surely has some interest in his future material and economic welfare, and, if he is somewhat of a judge of human qualities, ought to be in a position to direct and advise in the vocational training of his men. This of course necessitates an acquaintance with the various branches of work that are available, the estimated capabilities and fitness of the patient, both physically and mentally, his former occupation, his future intention, and his adaptability. Who is there in a better position to determine these factors than the ward surgeon?

Not uncommonly in a ward of thirty patients it will be found that twenty are very much in doubt as to what they intend to do a year hence. Many may be engaged in a particular branch of vocational training which they don't care about, but would rather not say so; others don't want to go to their classes for some obscure reason; others have no idea as to what the ultimate outcome of their injuries will probably be, and would like to have an inkling; and still others have a lot of things they would like to know about, but aren't sure as to how to proceed to find out, and often for some strange reason don't ask.

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If each felt that his own doctor, the ward surgeon, knew all about these things and was interested, he would not hesitate to ask for advice.

In all previous wars the disabled soldier has been allowed to drop rather abruptly, as soon as his wounds were healed, into civil life and often one of resentment. This will be prevented under the present comprehensive plan of graduating disabled men into usefulness to themselves and society, and still the one who will linger longest in each soldiers' mind will be the ward surgeon who will, therefore, be the most "sworn by" and necessarily the most "sworn at," and the latter can be greatly minimized if he will carry his interest and activity on beyond the purely medical and surgical work into the field of vocational reconstruction.

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EDITORIALS

THE ANNUAL MEETING

The annual meeting of The Association will take place from the 13th to the 15th of this month at St. Louis.

The headquarters of The Association will be at the Hotel Statler and the hall of the hotel will be used by The Association for its business meetings and for the addresses which constitute the literary program. Endeavor has been made to present an interesting program, one which may be instructive as well as interesting. It is hoped that there may be discussion of the papers read. It seems to us that this is peculiarly useful in bringing out the points in any paper. It is the dressing on the salad which helps us to appreciate the flavor. Furthermore, a paper on any given subject is the opinion of one man together with his interpretation of the views of others on the subject, and his own views are corroborated by such evidence as he can find. It is always interesting, we believe, to know what the other man thinks as to your premises and deductions.

There are a number of questions of importance to The Association to be brought up, and it is earnestly hoped that there may be a large representation of the membership to aid in the determination of them.

From letters which reach us there appears to be a misunderstanding as to eligibility to membership. Many assume that because they have been mustered out of the service their eligibility "ceases and determines."

This is not so, as they may be elected to Associate membership. Speaking as a member of The Association and not as the editor, we hope that this may be so amended as to permit their election to the active list. An officer of the services who has been elected to active membership continues in that classification after his reversion to civil status. It would seem logical to us to still allow him to join the active list after his duty to the state is finished.

We print below the program for the meeting as arranged at present. There are other features to be added to it by the local committee at St. Louis and we have not as yet received their suggestions. We believe that the various sessions will have a live interest for all the members, and we earnestly hope that there may be a large and enthusiastic attendance at this the first meeting since the end of the war. In the November and December issues of the journal we expect to print the proceedings of the meeting. Come there and help make the proceedings!

There will be a Register Book at the Desk of the Hotel Statler. It is requested that members register in this when coming to the Hotel, in order that as full record of the attendance as possible may be kept.

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Tentative Program, Annual Meeting of the Association of Military Surgeons U. S., St. Louis, Missouri

MONDAY, OCTOBER 13

Opening Meeting at 9.30 a. m.

1. Address of the President; Reports of Executive Council, Secretary-Editor and Treasurer, Committee on Arrangements, Literary Committee, Committee on Legislation, Boards of Award, Necrology Committee; Appointment of Nominating Committee, Auditing Committee, and Committee on Resolutions; Consideration of Amendments to Constitution and By-Laws; Miscellaneous Business.

2. Addresses: "The Next Steps in Combating Venereal Diseases among the Armed Forces of the United States," Col. William F. Snow, M. C., U. S. Army; "Logistics of the Naval Medical Department for Distant Operations of the Fleet," Capt. F. E. McCullough, M. C., U. S. Navy.

Second Session, 2 p. m.

1. Addresses: "Plan for the Immediate Care and Reconstruction of Battle Injuries of the Face and Jaws, Based on our Late Experiences," Lieut. Col. Vilray P. Blair, M. C., U. S. Army; "The Army Medical Museum," Col. Charles F. Craig, M. C., U. S. Army; "The Future of Psychiatry in the Army," Dr. T. W. Salmon.

Third Session, 8.30 p. m.

1. Motion Pictures showing activities of the Medical Department in France (one-half hour).

2. Addresses: "A Scientific Basis for the Greater Resistance of the Seasoned Soldier, as Compared with the Recruit, to Infectious Diseases," Col. Victor C. Vaughan, M. C., U. S. Army; "Pathology of Lethargic Encephalitis," Lieut. Col. Simon Flexner, M. C., U. S. Army.

TUESDAY, OCTOBER 14

Fourth Session, 9.30 a. m.

1. Report of Nominating Committee.

2. Election of Officers.

3. Addresses: "Some of the Earlier Problems Confronting the Medical Corps of the American Expeditionary Force," Cols. S. H. Wadhams and A. D. Tuttle, M. C., U. S. Army; "The Military Aspect of Base Hospitals," Lieut. Col. Gustavus M. Blech, M. C., U. S. Army; "The Care of Six Hundred Cases of Penetrating Wonnds of the Chest," Lieut. Col. Walter Fischel and Capt. Hugh McCullough.

1 P. M., Luncheon Washington University Medical School.

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Fifth Session, 2 p. m.

In the Auditorium of the Washington University School of Medicine, Euclid Avenue and Kingshighway.

1. Addresses: "Modern Military Medical and Surgical Reconstruction in Relation to Vocational Education of Discharged Compensable Disabled Soldiers," Col. Frank Billings, M. C., U. S. Army; "The Importance of Physical Therapy in Military and Civil Practice," Comdr. William Seaman Bainbridge, M. C., U. S. N. R. F.; "Physical Reconstruction in U. S. Army Hospitals," Col. H. A. Shaw, M. C., U. S. Army.

Sixth Session, 8.30 p. m.

1. Addresses: "Morale—An Asset to a Fighting Force," Col. E. L. Munson, U. S. Army; "British Ambulance Trains" (Illustrated), Capt. Frank L. Pleadwell, M. C., U. S. Navy; "Observations on an Epidemic of Influenza in an Isolated Post of the A. E. F.," Maj. Alan M. Chesney.

WEDNESDAY, OCTOBER 15

Seventh Session, 9.30 a. m.

1. Installation of Officers.
2. Reports of Auditing Committee, Committee on Resolutions, etc
3. Unfinished business.

A COMMISSION AS AN ASSET

All values are relative, and there is a "good" only because there exists a "bad," which it transcends.

Also there exists in the scheme which governs our destinies a law of compensation. Sun follows rain and the delights of summer mitigate the months of cold and ice and snow.

When it became imperative that the world be made safe for democracy we closed up our accounts, told our patients that we would come back and cure them after the Hun menace was abated, and went off to ship or camp to change our customs, if not our profession.

We did this for reasons varying between the extremes of the lust for adventure and the mandates of the Draft Board, and, calculated in terms of arithmetic based on dollars and cents, we most of us made a sacrifice.

It is comforting, however, to realize that compensation is not all measured by coin of the realm—that there is pay for service other than that which can be entered on a deposit slip and handed in to the receiving teller.

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We have moralized on this more or less editorially in past issues. Perhaps unnecessarily so, since it is presumably apparent to everyone that work with the armed forces was more than a duty to be done—was in itself an education which, as all true education, had a tangible personal value to each of us.

We got, out of our service for the country, experience, a broader view, new methods and a knowledge of conditions about which we had hitherto been uninformed. Even those of us who came back with sore heads and a grievance will admit that we know now how not to do it.

Aside from the loss of practice in our absence with the colors, of the fact that we must win back again the clientele which has drifted to strange gods while we were away—the fact that we have been colonels or captains has a fixed value in the post-bellum existence aside from being something which it is a satisfaction to have done.

We do not make this as a loose statement—a matter of our own personal opinion—but as the result of evidence from many who have been medical officers in service and have now reverted again to civil status.

A few days ago we were looking over a copy of the *Journal of the American Medical Association*. In the advertising columns, under the heading "Partnerships Wanted," "Locations Wanted," and "Situations Wanted," out of a total of 62 who advertised, 31, or 50 per cent, stated as a qualification that they had had service with the colors.

There is nothing to indicate whether these 31 came out from a commissioned status entirely content with conditions under which they served, but it is manifest that each of them believes that the fact that he took the oath of allegiance as an officer makes his services as a professional man of more value—renders him more desirable.

It is published testimony from many parts of the land as to the value of service, of the fact that even to have had a commission is a real and tangible asset.

J. R. C.

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COMMENT AND CRITICISM

REPORT OF THE PROCEEDINGS OF THE MEDICAL VETERANS OF THE WORLD'S WAR AT THE FIRST MEETING AT ATLANTIC CITY, N. J., JUNE 11 AND 12, 1919

First Session, June 11, 1919

The first annual meeting of the Association took place at Atlantic City on June 11, 1919; the meeting was called to order by the temporary president, Dr. Hubert Work. He announced the appointment of the following committees:

Committee on Organization: Dr. John M. Dodson, Dr. Rock Sleyster, Dr. H. D. Arnold.

Committee on Nomination of Officers: Colonel Frank Billings, Dr. J. N. Hall, Dr. Cornelius Van Zwaluwenburg.

Committee on Constitution: Dr. Victor C. Vaughan, Col. F. A. Winter, Dr. H. L. Graves.

Committee on Membership: Col. F. F. Russell, Dr. A. T. McCormack, Dr. D. C. Brown.

The gentlemen named by the Nominating Committee were unanimously elected by the members present, between two and three hundred. They are as follows: *President*, Dr. Victor C. Vaughan; *Vice-President*, Admiral E. R. Stitt; *Secretary-Treasurer*, Col. F. F. Russell. *Trustees:* Col. F. A. Winter, Dr. George E. Brewer, Dr. James C. Perry, Dr. John M. Dodson, Dr. Hubert Work, Dr. Holman Taylor, Dr. Joel E. Goldthwait.

The new president, Col. Victor C. Vaughan, took the chair and addressed the meeting as follows:

The medical profession may feel proud of what it has done in this war. The draft boards were all supplied with one medical man at least. General Crowder has testified to the excellent work done by men on the local draft boards. There were stories afloat that men with glass eyes and wooden legs were passed by the medical men on the local draft boards. General Crowder has taken the opportunity to officially deny that any such things ever occurred. More than 32,000 men from civilian life came when their country called. Some 20,000 men acted on local and general boards. It is estimated, I believe, that at least 70,000 medical men out of a total of about 140,000 responded to their country's call. They are ready to do it again if the necessity arises.

It was my task, or a part of my duty, when the war began to urge young men to go to the British Army to serve, and I said to those young men at the time, "You cannot afford not to respond to this call," and they did so nobly, and I am sure that no one who has done so regrets it. I do not know exactly the number of medical men who were killed or died of wounds. The last time I went over the list in the Surgeon General's Office, which was soon after the armistice was signed, there were seventy

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odd medical officers killed or died immediately or within a few weeks from wounds. The House of Delegates yesterday did reverence to these men by standing for a moment in silence, and I ask you to do the same.

We realize what the young men sacrificed financially by going into the Army. We older men made no sacrifice. Our work in a professional line was practically done; but the young man, five or ten years out of college, who had bought his home, still unpaid for, and had built up a good practice, sacrificed much. In the speeches that I made to these young men at the time that I was urging them to go into the service, I said, "You can expect no financial return from this; when you come back from the war you will live on the side street while the man who stayed at home will live on the avenue; you will be content, or must be content, when you have an opportunity to deposit a few hundred dollars in the bank of which the man who stayed at home is the director." In my own little town an amusing incident occurred a few days ago. Of course the best young men went, best professionally and best personally. A good lady who had employed one of these men said to him the other day: "Doctor, you mustn't think that we have forgotten what you did for our family, but Dr. Smith stayed at home and took care of my children when you were away and we owe him something." Whatever we may say, this is going to be the feeling. Now, I am sure, as I said two years ago, the time will come when there will be two grades of men in this country, not only in our profession, but elsewhere—the men who went and the men who stayed at home, and, whatever it has cost financially or otherwise, the men who went will have the consciousness of having done their duty and will be the winners in the long run.

The war has been of immense advantage, strange as it may seem, to the medical profession. Wars have frequently contributed much to medical knowledge. Look at the charts in the exhibits here in Atlantic City today and see the low place occupied, so far as the cause of death is concerned, by typhoid fever and other enteric diseases. It was my fortune to walk the hospitals in 1898 and see 20,000, more or less, of cases of this dreadful disease, while in the late war, with, I think, four millions of men under arms from our country, the deaths from typhoid fever and kindred diseases numbered only slightly above 200. This war has made us realize certain things which I must take a few moments to present to you. While the enteric diseases and many other infectious diseases have been practically banished from the armies of the world, our own and other armies, we are today without the knowledge necessary to deal with the respiratory diseases, either in prevention or in cure. This is a task which lies before us today, and I am optimist enough to predict that when the next war comes, if it doesn't come altogether too soon, we will be able to control these diseases to the same extent that we do the enteric diseases today.

We are to realize, gentlemen, that sanitation alone—improved water supply, sewage disposal, clothing, housing and everything of that kind—will not enable us to get rid of these diseases. We need further information, we need more research along these lines. The great Arctic explorer, Maude Stephensen, put up to me the other day in a private talk the following question. He said: "Suppose there was an island in the Pacific Ocean, inhabited by 100,000 savages who had never had measles or pneumonia, living in a savage state, and I should say to you, 'Go to that island; you can have all the money that you want, all the help, all the skill that the world can command, and put that island and its people in the most perfect sanitary condition, and when you get ready, I will introduce in a thousand places in that island measles and pneumonia. You are not to quarantine. 'How many deaths will you ave by the work that you have done?" I said, "Not one." And I believe that is

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true. It is a question, apparently, today of immunity or increased resistance to these diseases. Fortunately, notwithstanding the epidemic of influenza and pneumonia, notwithstanding that our death rate jumped from August, 1918, to October, 1918, to nine times the former rate, the death rate in August was less than 5 or about 5 per cent of the annual death rate per 100,000, and it jumped to 47; notwithstanding that, we have come out of this war with the lowest annual death rate of any army that ever engaged in any war in recent times, in so far as we have any statistical data.

This organization, gentlemen, promises to be one of the most powerful in the United States, so far as the medical profession is concerned. We are all to work together for the good of humanity and for the advancement of the profession. I consider it the greatest honor that has ever come to me to be asked to preside over you at this, your initial meeting.

GENERAL WINTER: Mr. Chairman and gentlemen, the committee appointed by Colonel Work to consider the question of the Constitution and By Laws for this Association is of the opinion that, in view of the fact that the Constitution and By-Laws preliminarily gotten together were very carefully devised in Washington with high legal assistance, that it would be appropriate and expedient that the Constitution as written in this pamphlet be accepted by the meeting here this afternoon as the document upon which we would work, at least for the time being. You will, of course, readily understand that, in the very limited time given to Colonel Vaughan and his committee, it was impossible to go to any very considerable degree into the ramifications of this document. Hence it is the opinion of the committee and it is so recommended by the committee, that this Constitution, as written here, be at least tentatively adopted, and I move you to that effect.

Motion seconded. Constitution adopted.

MR DODSON (Committee on Organization): Your Committee on Organization were in some doubt as to what their field was, where the line might be drawn between Committee on Organization and on Constitution, but we were determined to get in the limelight somehow, and therefore we offer this report:

1. Inasmuch as one of the purposes of the M. V. W. W. is to offer opportunity to renew associations and friendships formed in the great war, it is recommended that:

(*a*) A chapter of this organization be provided for in each state, meetings of which may be held at the time of meeting of the State Medical Society.

Subsidiary chapters may be organized in the larger cities.

(*b*) That consideration be given by the officers to be elected at this meeting or by a standing committee on organization as to the desirability of arranging for special sections of the national organization representative of the several lines of service provided for in the membership.

(Signed) ROCK SLEYSTER,
H. D. ARNOLD,
JOHN M. DODSON,
Chairman.

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Report adopted.

COLONEL RUSSELL (Committee on Membership): The qualifications for membership, as stated in the Constitution, provide that all medical members and medical examiners of Local, Medical Advisory and District Boards, officially appointed by the President of the United States, the Provost Marshal General of the United States Army, and the Governors of the various states, be qualified for membership. The Committee on Membership recommends one additional phrase, which would provide for admitting to membership in the Association those members who actually worked on the Medical Advisory Boards and District Boards but were appointed by the President of the Board, provided that they were vouched for by the Medical Aide to the Governor. In the early part of the draft, the members were all appointed by the President, the Provost Marshal General and the Governor. As time went on, there were some additional members appointed by the boards themselves. Now, if those members can be vouched for by the Medical Aide to the Governor, it is recommended that they be eligible for membership.

Adoption moved and seconded.

DR. WINSLOW: Is there a provision to include the members of the medical profession of the United States who served in foreign armies. I cannot find such reference.

Moved that under No. 1 be added "And all American surgeons who served in Allied armies."

COLONEL RUSSELL: Mr. Chairman, may I propose an amendment to that? Section 3 now reads: "Members of the medical profession of Allied nations." I suggest that we cut out "Allied nations" and have it read: "Members of the medical profession who have been in the service of the Allied governments during this war." The Allied governments must vouch for these men, I understand.

Amendment voted upon and carried.

Report, as amended, carried.

COLONEL WELCH: . . . whether or not the Constitution is designed to include or exclude those who were not in the Army but who served in the Red Cross overseas. It is not explicitly stated whether the men in the Red Cross were in the war or not.

COLONEL BILLINGS: Inasmuch as there will be questions of this kind as to who will be eligible, who are not already mentioned in the Constitution, I would like to make the motion that this be referred to the Committee on Constitution and By-Laws. For instance, there are all of those members of the old Reserve Corps who didn't get into actual military service. Many of them were kept at home to teach.

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They served the country, and there are many others, such as these Red Cross men; we can't take this up this afternoon, and it should be referred to the committee to report at some future time.

COLONEL VAUGHAN: We have adopted a Constitution and By-Laws. Speaking on the point of order, when the Constitution provides a special way of amending it, it is the only way it can be done except at any meeting by unanimous consent. If this meeting wishes by unanimous consent to amend that Constitution and By-Laws it can do so.

The Chair will remind you that the subject of modification by the house, that all of these amendments are out of order. The Constitution has been adopted and there is a way provided for amending the Constitution and By-Laws, and that way will be followed. So all these amendments, and even the report of the Committee on Organization, are out of order.

In the Medical Corps of the Army we have been exceedingly fortunate in having two most distinguished gentlemen and able medical men as our leaders. It was exceedingly fortunate for the medical profession and for the country at large that a man of General Gorgas' wide knowledge and scientific reputation was Surgeon General of the Army. When General Gorgas was retired, we were again fortunate in having appointed to our leadership a distinguished representative of our profession, who is present with us today, and I am sure that it would be highly improper to adjourn this meeting without a word from General Ireland.

GENERAL IRELAND: Mr. President and gentlemen, I am very glad to be here and meet you all. I am very glad that you are going to unite in an organization to continue this friendship which has grown in the last two years. It will be the greatest pleasure to me to assist you in any way possible in this organization. I don't know what I can say to increase the enthusiasm and good-will that exists here today, except that I believe it is a good thing for the men who have done such splendid work, and the profession has cause to be proud of the work it has done in the last two years—to get together frequently.

COLONEL VAUGHAN: The success of the medical profession in this country, the example set by certain men, the untiring devotion of certain men, I think that this body will be glad to recognize, and I should feel that I had not done my duty today and had not carried out your will if I failed to call upon one or two of these men. The great success of the Laboratory Department of the Army was one of the most phenomenal things that the medical profession has ever accomplished. When the war closed in 1898, when every camp in the United States was filled with sick, dying and dead, there was not a microscope or a

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laboratory in any camp in the United States. In this war, from the very beginning, there was an excellent laboratory, well manned and well equipped, in each camp in the United States. We owe this largely to two men, and I want at least to have you recognize that fact. I am going to call upon Colonel Welch to say a few words to you.

COL. WILLIAM H. WELCH: Colonel Vaughan, Surgeon General, other members, I agree with all that Colonel Vaughan said in his opening address, and especially with what he said about the relative sacrifices of the younger and the older members of the medical profession. I, as one of the older members of the profession, regard it as one of the greatest privileges of my life to have had the opportunity to serve in the Medical Corps of the Army. I cannot claim to have rendered any conspicuous service, but it has been an opportunity which I cherish as one of the greatest privileges in my whole life.

I feel that this organization has a very great and somewhat varied purpose to serve. It will not be merely to keep fresh the memories of our experiences during the war; it will not be merely to bring together, important as that is, the results and the lessons which we have learned from this war; but I think it equally important that we should keep in mind the necessity of continuing preparedness. The state of the world is uncertain, but, however varied one's judgment may be on the future, I think all will agree that it is of the first importance that we should not enter another war, if it should come—we hope it may not—with any such sort of unpreparedness in the profession as a whole as we faced in April, 1917. I think one of the important functions of this organization will be to see that our profession is kept alive to this great demand, this patriotic demand, that suitable measures are taken in order that our medical students shall receive a measure of training in military matters, and that the members of the profession as a whole are trained to serve without that long period of apprenticeship which was required when we entered the war.

I recall, only three weeks ago, when traveling with Colonel Russell in France, that when journeying from Paris to Boulogne we stopped over at Etaples in order to learn something about the work which had been going on there in one of the laboratories. There was an assemblage of many hospitals—really difficult to find our way around—and we inquired of a British soldier how to reach this particular institution. I said to him, "How long are you going to remain here?" because there was apparently much more going on there than with the American forces where we had been. "Oh," he said, "during the duration of peace." His point of view—but something in it.

I think, therefore, that this is something we should keep in mind, that we shall see to it that the profession as a whole is more ready,

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more informed as to the military needs than it was in the past. What would have been the situation if there had not been a nucleus of the regular Medical Corps of the Army to take the leadership when we entered the war. How helpless we would have been, and how little we realized our helplessness. The military game is something which has to be learned. It is to me, therefore, the greatest possible delight and privilege to have had this service and now to be a member of this organization, which I am sure has in it the possibilities of development and growth and influence which will be for the good of the whole country.

COLONEL VAUGHAN: Gentlemen, I believe General Winter has a matter which he wishes to bring up.

COL. F. A. WINTER: Mr. Chairman and gentlemen, I am not here altogether voluntarily, or entirely on my own initiative, to lay a proposition before you. I have been delegated as a member of the Executive Council of the Association of Military Surgeons by the President of the Association of Military Surgeons to speak to you for just a moment on a question which has arisen in our minds as being possibly appropriate this afternoon.

The Association of Military Surgeons, as many of you know, was organized in the year 1892, through the driving force of Brigadier General Nicholas Senn, of the State of Illinois. The Association has gone on now for all of this length of time—something like twenty-seven years—and it now embraces something like 9,000 members. It has a journal which is carried on regularly once a month and which, I think we may say without rendering the editor, who is present, unduly chesty, is a representative journal of military medical men. Furthermore, and a factor of the most material moment, the Association of Military Surgeons has in its treasury $25,000. Now what we proposed—as I say, on delegation from the Executive Council of the Association of Military Surgeons—is to invite this body which has organized here this afternoon to come into the Association of Military Surgeons lock, stock and barrel on a parity with the other members of the Association of Military Surgeons.

The idea occurred to us that there was going to be a multiplicity of these societies in America. I was talking to General Munson the other day—from the Morale Branch—and he told me this was being recognized. Now, without any disparagement in the world to the handsome spirit shown here this afternoon, which must be a very gratifying one; without casting the slightest disparagement on this organization, I don't see why we can't consolidate the whole bunch into the Association of Military Surgeons.

Now it will be easily possible to take every man who is provided for

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under the terms of membership, as stipulated in the Constitution of the Medical Veterans of the World War, into the Association of the Military Surgeons. I would, therefore, look forward to the time when the Association of Military Surgeons, instead of having 9,000 members, would as a matter of fact have 9,000 members probably plus the 35,000 or 40,000 people who have been identified with us in the war and have enabled us to carry on the war.

It is you gentlemen from civil life who have provided the sinews that have carried forward this war. I submit this matter to you—present an invitation that you cast your fortunes in with us. If you don't do it, I shall expect to be a member of the Medical Veterans, of course, but I don't see any reason why we should have the two associations.

You will have control of the other organization exactly as you would have of this one. The plan would contemplate that in each city and each state there would be a subsidiary branch which would enable you to get together and fight the war together whenever you saw fit to engage in that particular pursuit. It would be a governing body in itself.

I have very great pleasure in submitting this proposition to you and, of course, it will be the decision of this body as to whether you wish to take it or not. Personally, with the most glowing interest in the great body of the profession who have been with us and the most ardent desire to see a consolidation of the activities of those gentlemen as a perpetuating institution for the benefit of the government services, I should be most delighted to see this result come about, and I submit it to you for your consideration and such action as you may be inclined to take.

Dr. Edward V. Delphey: Mr. President, I offer the following resolution for consideration:

Whereas, it seems altogether unnecessary and inexpedient to have a multiplicity of societies or associations for the same purpose; and

Whereas, there is already in existence an American Association of Military Surgeons which has the same purpose in view as has the Medical Veterans of the World War; and

Whereas, the aforesaid American Association of Military Surgeons has extended to this body an invitation to join and be amalgamated with them; therefore be it

Resolved, that the Board of Trustees of this body be and are hereby directed to take the necessary steps to effect such juncture and amalgamation; and that any member who does not wish to be a member of the American Association of Military Surgeons may on demand have his yearly dues returned to him.

Dr. Brown: Mr. President and gentlemen, I see present here today one gentleman who, with me, was one of those who organized the original Association of Military Surgeons, Dr. LaGarde. There are

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very few of the men left who began and who placed that organization upon its feet. I can readily see a very vast advantage to this organization if it accepts the invitation of the Association of Military Surgeons for amalgamation with it, but, inasmuch as there will be a very great number of details to be arranged in the matter of accommodating this organization with its particular purposes, especially those of maintaining the memories of recent war, which memories have nothing whatever to do with the Organization of Military Surgeons, I think we might well adopt, or accept, the resolution which the gentleman has just presented and leave the details of the choice of what shall be the name of the new combined organization, its purposes and its methods of continuation, entirely to the Board of Trustees of this society. Of course there should be some means whereby the honor that has been achieved by the gentlemen who have taken part in this recent war should be passed on to the dependents of your men, just as in the Loyal Legion the honors that came to the men who were officers of the Civil War or the War of the Revolution have been passed on to the sons of those men. It would be a question as to whether it would not be better that the name of the organization here organized should be accepted and held in the place of the other organization, the Association of Military Surgeons. There would be questions in relation to acceptance of property, titles to same, etc., and, therefore, when we act upon this present resolution so recently offered, it should be with the giving of an extremely elastic authority to a board, probably the Board of Trustees already appointed by this organization, that they may organize the two societies into one, particularly looking after the welfare and future continuance of this organization. I second the motion offered by the gentleman.

COLONEL WINTER: As a member of both organizations, I naturally feel that I want to get them together, and I move you that, if it be the sense of this body, they "request the Board of Trustees to take as early action as possible on this question." (Seconded.)

A MEMBER: Mr. Chairman, Article 13, Section 1, says "The Board of Trustees shall have control and management of the affairs and funds of the society." If the question of amalgamation can't be referred under Article 19, it seems to me it can be referred under Article 13, Section 1.

A MEMBER: Mr. Chairman, "The affairs of this society" does not contemplate any change in this Constitution. It refers to the material affairs and not the Constitution.

COLONEL VAUGHAN: I think that point is well taken. Gentlemen, the Chair will remind you that this is a matter which will involve a change in the Constitution which has been adopted, and it will be

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referred to the Board of Trustees in accordance with Article 19. It will come up a year from now for discussion.

COLONEL VAUGHAN: Is there any desire to have another meeting before we leave Atlantic City? To what time shall we adjourn?

A MEMBER: Mr. President, I would like to ask if women physicians are eligible for membership in this Association who were not commissioned but did good work at home and abroad—child welfare, etc. I have in mind ladies who did that sort of thing.

COLONEL RUSSELL: Contract surgeons are eligible.

A MEMBER: These are not contract surgeons.

COLONEL RUSSELL: Then they are not eligible. (The question was referred to the Board of Trustees.)

DR. WORK: In order that certain matters that are not clearly understood and certain new matters that the members have not thought of be worked out to the satisfaction of all present as nearly as possible, I move you that when we adjourn that it be until 4 o'clock tomorrow at this place and in this room. (Seconded.)

The meeting adjourned.

2D SESSION, JUNE 12, 1919

The meeting, which was well attended, was called to order by the president, Col. V. C. Vaughan, who called upon Surgeon General Ireland.

GENERAL IRELAND: Mr. Chairman and gentlemen, the medical profession of the world has been on trial now for nearly five years and we have made good, and I think it is perfectly fair to say that the medical profession of the United States has given a better account of itself than that of any other country.

We have done this under conditions that are almost unfair. We are not a military nation; our people will not provide for the emergency of war in time of peace. Yet when war is declared there is no nation on the face of the earth which demands such a high degree of care for its soldiers as do the people of the United States.

When this war started two years ago we had less than 450 officers in the regular Medical Corps and 1,600 in the Reserve Corps. Now those of us who had given some thought to the responsibilities of the Medical Department in time of war were pessimistic as to whether we could get a sufficient number of doctors quickly enough to meet the emergency before us.

A war of the present day runs into millions of men. In fact the whole nation is mobilized, and it takes about 10,000 doctors to care for every million men placed in the field.

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The medical profession met the situation in a splendid manner. My understanding is that there are not to exceed 150,000 registered physicians in this country. A great many of these men are not practicing their profession, and many others are beyond the military age. Yet on the 15th of November, 1918, nearly 35,000 doctors had been commissioned in the Medical Corps and were in active service. This does not take into consideration the thousands of doctors who were assisting the Provost Marshal in executing the draft act and in performing other essential duties necessary to the successful carrying on of the war. It is fair to say that at least 50,000 doctors were giving all or the most of their time for war purposes the middle of last November—about a third of the registered physicians of the country and a little less than half of the actual number of doctors eligible for military service.

They brought with them in this new service a perfectly splendid spirit. One of the finest things I ever saw was the spirit these men brought with them to France. They brought with them into the Medical Department a professional ability of the very highest order. No soldier was ever protected from diseases and cared for when sick or wounded as the American soldier has been cared for during this war.

This was the work of the medical profession of this country, and I wish the line of demarcation which some prople try to make between the professional man in civil life and the professional man in the Army could be obliterated forever. There is not the slightest difference between them. I have always looked upon the medical man of the Army as the representative of the profession from civil life. We simply cast our lot with the Army, which is not attractive to a great many physicians. A physician gives up a great deal when he goes into the Army and leaves behind him everything, so far as competency is concerned, except a fair living. This, I am sure, many of you who have been in the service in the last two years have found out. Moreover, it isn't worth while for any physician to go into the Army who isn't perfectly willing to adapt himself to army life.

We are all, however, of the same profession, and the medical profession of the United States has done this splendid piece rf work for the country and deserve well from their fellow-men.

The Medical Department had to be expanded enormously in a very short time. Many new problems had to be met at once. The organization which was built up worked well as a whole, but no one believes it was perfect. There were shortcomings in many places, and this should not be a source of surprise because we had never had to meet problems on such a tremendous scale before.

I think it is the business of the profession to complete some organi-

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zation so that we will be brought closer together and be able to discuss and rectify the errors made in the past. I am a thorough believer in constructive criticism. It is through such efforts that the shortcomings of the past two years can be rectified and an organization built up which will do much better in the future. I think this great body of men, who have done such a splendid piece of work in the last two years, should keep up the friendships and traditions which have been started during this war. And the organization which is built up should be an active one. You know many of us are getting along in years, and someone else has to be prepared to pilot the profession through the emergencies that may come in future years. Just how you are going to do this is left to you. I am with you in any way you want to run your organization.

The suggestion was made here yesterday—the invitation was presented by General Winter—that you come into the Association of Military Surgeons. It rests entirely with you, gentlemen, whether you do this or not. The Military Surgeons, as you know, is a National Guard organization. Seventy per cent of the members of the organization belong to the profession in civil life. The members from the Army, Navy and Public Health Service are almost a negligible quantity. The organization has an official publication which, it seems to me, should be the mouthpiece of this organization, for the two bodies have about the same object in view.

I am perfectly willing, and only too glad to have the privilege of assisting the organization of the Medical Veterans of the World War in any way I can. I think they should be organized. I think it would be a calamity if the traditions of this great body should disappear, if we should not take advantage of the present time to perfect an organization so that the medical profession of the country would never again be caught unprepared to meet an emergency.

Dr. Dodson: Mr. President, I think we all feel that a multiplicity of organizations is undesirable and that if some sort of merger can be effected between the organization which we formed here yesterday, or which had been formed before but which we indorsed, with the older one, it would be advisable. But, without going at all into the merits of the question or the method by which it is to be effected, I would like to call attention to the fact that it has gone beyond us. This body is not the proper body to order the Board of Trustees to do this. We are a small group of more than 1,200 men who are members of this Association today. I personally have solicited a thousand men in Illinois to become members of this Association, and a large number of them have joined. It would not be fair to them to abandon the one thing that

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appealed to them, and that is the name and the appeal which it makes to them as a memorial of the great war, an ackowledgment of the fact that they were concerned in one way or another in this war.

I should like to move, therefore, Mr. President, an amendment to this: That the Trustees be directed to consider this question, but they do not be ordered to make this merger; for, while under our Constitution the Trustees are given this authority, I question very much whether that Constitution should not be so amended by the Trustees as to give the full membership of the various state organizations which will be effected a voice in so vital a matter as this.

Amendment seconded.

DR. COSTELL: Does the membership in this organization include men who served in other capacities than on the draft boards, and will there be provision in this organization for a state organization, or will the state organizations be independent of the parent organization?

COLONEL RUSSELL: State organizations are provided for.

DR. COSTELL: Organized by the National Association or by the states?

COLONEL RUSSELL: The initiative can be either way. If the state does not of itself organize, the National Association will try to have one organized, but the states will have the power of making their own organization.

COLONEL BILLINGS: Mr. President, I feel like substituting an amendment. This is a new organization. The possibilities of the membership are great, and we don't know what the attitude of many men who are eligible may be. Should we at this time take action which will practically change the whole idea which has been presented to many members? As it happens, I am a member of the Association of Military Surgeons. I agree with those who have spoke and believe that the lesser number of organizations would be better and, provided a proper fusion can be brought about, I am strongly in favor of it; but do not believe that at this time the present members should take action which may embarrass the future membership—that is, of obtaining the members. We are just starting out on a propaganda to get members, with a possibility of 50,000 members. We only have 1,200, and we should in the next year attempt to secure as nearly the 50,000 as may be possible, leaving it to the final action of that body as to whether they desire this fusion, and then the question of details of the fusion may be left to our Trustees. I am greatly in favor, sir, of the amendment to the motion.

COLONEL WINTER: Yesterday I was made the mouthpiece, the proponent, of this plan to consolidate the two organizations. I have

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learned a good deal since I have been here in Atlantic City by rubbing up against the volume of men I have met here and who have illuminated me upon a good many points. I am quite in concurrence with what Colonel Billings has stated. The plan that he outlines, the general survey which he gives, has my most hearty concurrence. I believe that the organizations could be fused without any trouble, but, as Dr. Dodson and Colonel Billings have said, I think it would be better to take a little time and ascertain the wishes of the men who have come into the organization.

It was moved and seconded that the motion to amalgamate the two societies be laid on the table.

DR. ARNOLD: Mr. Chairman, I do not know whether I can speak exactly on the point or not, because I have a number of doubts in my mind I would like to have cleared up. I would like to know, in the first place, what power this amendment, or the motion itself, leaves in the hands of the Association, and how much it removes from the hands of the Trustees, who are at present unnamed. I would like to know just exactly what power these Trustees have. According to the ruling of the Chair yesterday, the Trustees have sole power over all the affairs of this Association. I think there should be a full and free expression here, both as to whether we shall amalgamate and also as to whether the Trustees are to have this power—whether we shall leave all this power in the hands of the Trustees. "The Board of Trustees shall have control and management of the affairs and funds of the society." At present this Association has been comparatively inarticulate. There are comparatively few people here, compared with the whole number of men, who have spoken, and I think it will require a great deal of discussion, free and impartial, as to the merits not only of the immediate question in hand, but as to the reasons for leaving all of this authority in the hands of a very few, so that amendments cannot be made by the organization as a whole, but must be made by the Trustees. I have no prejudice in this matter as to the union of these two organizations because I belong to both of them. I am very strongly in favor of this organization, and I hope I have been—I have intended to be, at least—a loyal member of the other, but I really think that every man in this organization ought to have a chance to speak upon this offer. There should be some way, if it is the consensus of opinion, by which the whole membership as a body can have some control over its own affairs. I therefore move that—

The Trustees be instructed to consider the feasibility of a union of the Association of Military Surgeons with the Medical Veterans of the World War and to report at the next annual meeting of the organization.

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The motion was seconded.

DR. DUNN: Mr. President, it occurs to me that one of the things we must not lose sight of at this moment is that sentiment is playing a very large rôle in the organization of this particular body; that, after all, while we may be organized for scientific purposes, altruistic purposes, the determining factor with a great many men in joining this organization is sentiment, and we must not lose sight of that. The union at this time of this organization and the Military Surgeons, it seems to me, will remove at once a large part of the sentiment which is going to control and influence a great many men to come into this organization or into the combined organization. Every man has had an opportunity to join the Military Surgeons who has joined this or considered joining it, and the absence of sentiment in connection with joining the Military Surgeons has probably made them slow to join it. The present sentiment has made everybody determine to ally himself with this organization. It seems to me that, not only for this organization but for the Military Surgeons, if finally amalgamated with it, it would be far better for us to form as an independent organization until we have gotten all the recruiting value of sentiment and then there will be plenty of time, it seems to me, to consider the amalgamation of the two organizations.

DR. DUNHAM: I think there is no question but what we are perfectly safe in leaving this matter to the Trustees to submit at the next annual meeting. I feel, sir, that there is going to be an organization of men who volunteered for the service during this trouble. There is a general feeling among all of us—Dr. Dunn said sentiment. If anything is done to kill that sentiment, we are certainly going to have another organization—no question about that in my mind at all. There will be no question of that, sir, in the minds of the Board of Trustees. Now if they are going to be empowered to consider this from all sides and report to the next meeting, I think we will have no trouble at all in leaving the matter there. I, therefore, move you the previous question of the motion and the amendment.

Seconded.

Amended motion voted upon and carried.

A MEMBER: I move that each member of this Association be constituted a committee of one on new members and be requested to bring in as many members as possible before the next annual meeting.

DR. BROWN: I hold in my hand the badge of the American Medical Association, but, above, the little bar which makes the pin at present the insignia of membership in this organization. We can readily perceive, those of us who have had some acquaintance with the fine arts,

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that this insignia was designed neither by Leonardo de Vinci nor by Michael Angelo. It is perhaps very appropriate for its purpose temporarily, but those who have been reading the mystic symbols inscribed across the top of it are not decided whether this means "many very witless women" or something of that kind, and, outside of any attempt at humor, and as one who I may hope has some repute for appreciation of things beautiful—not my hair, but things outside of that—I would consider that the psychological effect of this badge is not one that makes the purpose which it symbolizes particularly attractive to most individuals. I am trying by this camouflage of language to say that this thing is not at all appropriate as an insignia for men who are attempting to say that they have been patriots, and therefore I move that the question of a badge for the Society be referred at this time to the Board of Trustees with power to act, so that there shall be a badge that shall be appropriate and in harmony with the high purposes of this organization, the sacrifices, personal and national, that it symbolizes, and that all of us may wear without the suspicion of being classed among the Many Very Witless Women.

Motion seconded.

A MEMBER: I would like to rise to a question. Article 13, Section 1, says, under Trustees, "The Board of Trustees shall have control and management of the affairs and funds of this Society." I ask whether the Trustees have not this power already given them. I merely make this point because they apparently have unlimited power.

DR. BROWN: It is true that we may refer this question of the badge, which I do not by any means consider to be a small matter. It is of the very greatest importance to me. If we are to be a society that is to be recognized and respected throughout the country, for we must be, it is necessary that everything that goes with this organization should be of the very highest character, nothing cheap, low, mean or nasty about it. In referring this question of a badge to the Board of Trustees, personally I believe that it is best to put that problem, a very important one, I assure you, in the hands of a few men who shall have full power to employ such talent, artistic and otherwise, as shall produce an emblem of which we may all be proud, and I believe we may very safely pass over this duty to the very honorable gentlemen who were nominated yesterday as our Board of Trustees.

Motion carried.

COLONEL VAUGHAN: Lest we think the Army, made up as it was of both regular and volunteer civilian men, has won the whole war, I want to ask a man who sits before me, whom you elected to the office of vice-president yesterday, who has not been introduced to you, who repre-

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sents another arm of the service, to say a few words to you. Admiral Stitt!

REAR ADMIRAL STITT: Gentlemen, I thank you very much for the great honor that you conferred on me, and I can only say in connection with the Navy during this war that it has been impossible for us to say where there was a regular and where there was a volunteer. In inspecting our hospitals, etc., I have frequently come across one of the departments of the hospital and would be struck with the magnificent manner in which it was being run. I would ask some questions and find that this man had only entered the Navy from civil life a few months before. It was simply out of the question for us among the great mass of men in the Navy to tell who was volunteer and who was regular—all just the same.

There is one thing that I think should be understood by the profession. The Navy has a certain method of promotion. Everybody steps together in the Navy, and we all have to follow the line. When a line officer is promoted lieutenant, each "running mate" of that line officer, and by that we mean the men who entered one day after that (all staff corps follow the line one day), is also promoted. Everybody in the Staff Corps of the same date as that line officer is promoted as the line officer is, so that it is out of the question, even though a man might have tremendous ability, to do anything but follow the general rule all through the Navy, that he goes up according to his "running mate," as we express it.

There were some exceptions in connection with units entering from the Red Cross, where the Red Cross unit consisted of five medical officers, one surgeon, one internist, an ophthalmologist, an X-ray man and a laboratory man. These units were formed with lieutenant commander rank for the medical man and for the surgeon, and lieutenant or junior lieutenant rank for the other members, according to age. Of course, in these instances, the hard and fast rule didn't apply, but with this exception, everybody in the Medical Corps of the Navy, whether he was called "regular" or in the Naval Reserve, went according to the line officer; so that, if some people did not seem to be promoted as rapidly as their merits would justify, it was simply the system.

COLONEL BILLINGS: Mr. President, you stated as one of the reasons for calling this meeting this afternoon that there should be a little freer discussion of the purposes of this organization, and that must be considered, in some degree, the question of how we are to proceed in the propaganda of organization to influence membership, the methods by which we will proceed with the organization of the state constituencies. I think we must have propaganda, and some of us who have thought

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about this since it was first organized have discussed it to some degree—the purposes of it. As it happens, those who are eligible to membership have had an opportunity to serve in one capacity or another in the war. To begin at the inception of the induction of the man into the service, the medical members of all the draft boards and the advisory boards and the appeal boards had an opportunity that few men have to examine a large number of young men of a certain age; they had a wonderful experience in finding disqualifications. We recognize they did a good work. They rejected an average of 29 per cent of all that appeared before them from six millions during the whole period of the draft, and rejected them because they were either mentally or physically disqualified. They must have studied the men and found many remediable defects, and they set the machinery in motion to have those defects removed, not necessarily to qualify them for the Army but to qualify them for a continued economic citizenship.

Then came the medical boards in the camps, composed of temporarily commissioned men with some of the regular corps, and they again had a big experience and rejected an average of about 9 per cent of the men who had escaped the draft boards.

Next we had a lot of men in the camps who gave special training in the depot brigade and convalescent centers, and they have learned much.

Then we have the men who gave the special training on the other side.

Finally, we come to the clinical side of the experience, the men on this side in the hospitals, where the greater part of the work was medical, and the really wonderful development of military surgery in France in which many of them have contributed important additions to our knowledge.

That is the experience of our whole group of men, and the experience of each one is of great value. If we are going to have this organization simply for sentiment, that we meet together once in a while to swap stories about the war, it isn't going to last long. But if we have a purpose in view, to renew our acquaintance, talk over this situation and try to make practical application in civil life and for future use for the Army, if we have another war, the benefit that this experience has given us, then there is a real purpose in this that will make it last as long as we last and to the men that come after us, and I think we ought to get something of that kind particularly to the men in the states who have not been here to listen to this. Perhaps we have representatives among the members already here who could meet together for each state and who could agree today or during this meeting that they are going back home

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as the nucleus of a new formation in their states. It seems to me that, unless we do consider these things to some degree at this time, we are going to scatter and it is going to take a long time before we finally get the purpose at work.

DR. DODSON: Along the line of what Colonel Billings has said, it seems to me there are many possibilities of this organization in co-operation with other similar organizations. Two or three months ago there was organized in St. Louis the American Legion, a large organization of the men who were in the war, including privates and officers. Only a few days ago there was organized in Detroit the Officers of the Great War, and it seems to me that all together those represent an enormous body of citizenship who have great ideals and ideas which together could make a tremendous force for good in this country, and I think the cooperation of those organizations through committees, etc., would further the objects which we have.

DR. SHELAN: I would like to offer an idea in order to stimulate membership for the young men. This organization must be for young men to make it successful, I think. The young men are, after all, the ones who are going to comprise the personnel. As was said yesterday, the young men are the ones who have sacrificed. In no place in the United States is there one effort made to help the doctor who has been in the Army to get back on his feet in the medical service—absolutely nothing in the way of clinics for men. No place do I know of where a medical officer is assisted to regain the work he has lost. Because many of us have done nothing but hunt the elusive cootie, we have lost a great deal in medicine. We have gained in other ways, but have lost in medicine, and no effort is made to help us. I would make the suggestion, that this board formulate some plan whereby the boys who are returning in the near future can be offered, in New York or in some other great center, an opportunity for regaining the work they have lost, and I am sure that would do a great deal to eradicate the dissatisfaction which many of them feel, and it will be a permanent chapter of their whole life.

They see newspapers with great headlines about what heroes they are, and yet nothing is done for them, and I think this is the organization which should do something for the young men who are coming back, and the time to do it is now.

COLONEL MCLEAN: We don't need much propaganda to organize the different states. I fortunately belong to the same state as our worthy president. I know all those who were in the war overseas are only anxious to organize, but, as yet, there are a number who have not returned. They have talked this over informally. As soon as they return, we will have an organization, probably 90 per cent of all those who were in the service belonging to that organization. They are anxious to belong.

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Someone said something about the way he was received when he came home. I think probably there is something in it, but I assure you that is very temporary, because I believe as soon as we have those state organizations that the people who belong to these organizations will control those matters and control those clinics, and the other fellow will have to pay to come in when we get ready.

We have two great armies, the "regular" and the "irregular." I have belonged to the "irregular," and yet have a great respect for this "Regular Army." I have found them very gentlemanly, very courteous, very polite. These men started out as we did. This was as new to them as it was to us. They knew something about the Army and the red tape, which has been pretty well wiped out. I feel that there is no corps or branch in this Army, including the "irregulars," that did as great a service for their coutnry as the Medical Corps, and when this Medical Corps joins with this organization I think we will have a great, powerful body.

DR. BROWN: I am one of those who have been stamped with the red rubber stamp as being too old to serve, although I had been in the Medical Reserve Corps before the joining of issues of this country with those abroad. I have watched the course of events through the medium of many languages, many newspapers, and through personal contact and in personal touch with men speaking five different languages in my own city. No one can come quite so close to another person as he who speaks that other person's language. My city is Milwaukee, the city that is dishonored by Victor Berger. Our city merited to a great extent, in spite of the camouflage of newspapers to cover up our ulcers, the scorn and suspicion that existed against it throughout the United States, owing to the undoubted evil influence of our large foreign population; I will not speak of any particular group. Most of these men did not mean to be unpatriotic to this country. They merely did not understand it. Those of us who worked on the draft boards during the first five or six weeks in the effort to get the men together had occasion to handle numberless cases of malingering that were merely the result of fear and misunderstanding on the part of the men appearing before us. To such of those men who spoke but poor English as could be approached in their own language, an explanation removed a tendency toward resistance of the draft, and through my experience on the board there I came to the conclusion that there is no class of men in the world that holds in its hand the power for stimulating patriotism among those who have come across to this country to become citizens as does the medical man. We should realize that possibly we are the most powerful influence in this country toward stimulation of ideals

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among the uninstructed that shall make patriots of them. We come into their homes; we touch their hearts at the moments of greatest emotion; we are their most intimate confessors and to us come the secrets that never are whispered through the door of the confessional. While all that Dr. Billings has said about sentiment is absolutely true, yet we have in our hands—this great body who have saved and sacrificed—a power for good, a power for elevation of the country, greater than that of any other body, and that should be one of the fundamental purposes and one of the unsentimental aims of this organization.

COLONEL BILLINGS: Mr. President, will you not instruct the members from the different states that they should get together and form a nucleus during this meeting?

COLONEL WINTER: The question touched upon by General Ireland in his talk to our assembly here this afternoon, which contemplates the use of the Journal of the Military Surgeons as the organ of this body, was, I think, a very important one. We must have some means of circulating our proceedings and getting the propaganda going, and that journal has a circulation of 8,000 now, and I think we can influence the editor sufficiently to get him to put that into the journal and circulate it. I think that should properly come before this body. Mr. Chairman, upon the insistance of my friend, Colonel Billings, I move that the Journal of the Association of Military Surgeons be designated as the official organ of this society for the time being, in any event.

COLONEL RUSSELL: May I suggest that the motion be so worded as not to exclude the use of any journal in addition to that of the Military Surgeons. So far, the American Medical Association's journal, for instance, has been very kind, considerate and helpful in giving whatever this Association had to offer to them the widest publicity. I think we will need this publicity, and that, if this is so worded that we can use all journals in addition, it would work perhaps better in the long run.

COLONEL WINTER: I am perfectly willing to accept that if Colonel Russell will supply the verbiage.

A MEMBER: I would like to inquire if there is anyone here to speak for the Military Surgeons, that is, for their publication. It is possible they don't want us, and I would like to hear from somebody who really can speak for the publication.

THE PRESIDENT: I may say that the very able representative, the editor of THE MILITARY SURGEON, is present, and I will call upon Colonel Church to say whether THE MILITARY SURGEON is willing to act as the official organ of this body.

Colonel Church stated that it was perfectly practicable to carry on THE MILITARY SURGEON, the official publication of the Association

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of that name, as the representative publication of a society formed by the amalgamation of the M. V. W. W. and the Association of Military Surgeons.

DR. DODSON: Colonel Russell's suggestion is very important. If the journal of the Military Surgeons is going to be the sole organ, it would involve the subscription to that journal of everyone who joins this organization, or else they could not read it. It is important that the dues be nominal. We want to make the strongest kind of an appeal to every man who was in the war. I understand it was in the minds of those who conceived this organization that the organized profession, the American Medical Association, or the several state societies could without any expense to themselves provide the meeting places, and it will relieve this organization of practically all expense. In that way we shall be able to secure the members to whom a considerable membership fee would be a real bar at this time. If, later on, when the organization is in full bloom with a large membership, they elect to increase the dues and proceed on a more elaborate scale, that is for them to decide.

DR. BROWN: While we are in process of organizing a large association, it seems very important that we should have some organ to reach all of the profession who are interested. As Colonel Russell has said, the *Journal of the American Medical Association* has been open to us and has been used, and I am in hopes that this might be left to the Trustees to take under advisement and use whatever journal may seem best in their judgment for promoting the welfare of this organization.

DR. DUNHAM: I take it that is an amendment to the motion before the house. I second it.

The Board of Trustees will meet at the Hotel Statler, St. Louis, October 13, 1919, to consider the subjects which have been referred to it for consideration by this meeting and to decide upon the date and place for the next annual meeting of the society.

FREDERICK F. RUSSELL,
Secretary.

NEW YORK, *August* 31, 1919.

The Rockefeller Institute has received the following letter from the Surgeon General of the United States Army:

OFFICE OF THE SURGEON GENERAL,
WASHINGTON, D. C.

THE DIRECTOR AND THE TRUSTEES OF
THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH,
66th St. and Ave. A., New York, N. Y.

DEAR SIR AND GENTLEMEN:

During the war which is now happily past, your Institute proved to be one of America's strongholds. I am informed that from the beginning to the end of hos-

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tilities the entire institution was placed by you at the disposal of the War Department and that you did work of the greatest value, not alone for the Medical Department but for the Chemical Warfare and Air Service; that your hospital as well as your laboratories became in effect as much a part of the Army as the hospitals and laboratories established by the War Department in our cantonments.

I have also been informed that this great work, extending over the whole period of our participation in the war, was paid for entirely out of your own funds, and was without further support from the Government than the routine payment of salaries of such members and assistants of the institute as became part of the Medical and Sanitary Corps.

I thank you for your work of patriotism and your generosity in placing so fully at the disposal of the Medical Department your great and productive facilities for research, for teaching, and for the care of the sick.

Very sincerely yours,

(Signed) MERRITTE W. IRELAND,
Surgeon General, U. S. Army.

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CURRENT LITERATURE

Report on Medical and Surgical Developments of the War, by William Seaman Bainbridge, Lieutenant Commander, U. S. N. R. F. United States Naval Medical Bulletin. Special Number. Washington, Government Printing Office. January, 1919.

Commander Bainbridge states in the foreword of his interesting and valuable report: "This report comprises observations on the western front and in England during December, 1917, and the first six months of 1918, made pursuant to the instructions of the Surgeon General, United States Navy. For purposes of comparison, there have been added certain data obtained while in Germany during the autumn of 1915.

"In making the survey, the following objects were kept constantly in mind:

"1. To record the surgical lessons of the present war based on the experience of our allies.

"2. To secure anything likely to be of value to the United States Naval Medical School, Washington, D. C., or helpful in the preparation of medical men and hospital corpsmen for active service."

A somewhat different field is covered in this report than in the one made by Commander A. M. Fauntleroy, U. S. N., in 1915.

The report is divided into the following sections: Treatment of War Wounds by the Allies; Treatment of War Wounds by the Germans; Developments of War Surgery; Trench Fever; Care of Wounded from Firing Line to Convalescent Camp; Reeducation for the Disabled; Conferences of Surgeons; Auxiliary Forces; Miscellaneous; Recommendations; Technical Instructions for Impending Military Activities; Report of Technical Advisory Council; Base Hospitalization and Surgical Measures for an Attacking Army Corps; Cartilaginous Crainioplasties.

Under the heading, "Treatment of War Wounds by the Allies," the author discusses wound suture—primary, delayed primary, secondary—Carrel-Dakin treatment, other methods. The following are his conclusions in regard to primary suture:

"In justice to the method of primary suture, it should not be attempted in very large wounds with irregular tracks, where there is extensive shattering of bone, or in injuries dating back more than half a day or so (twelve to eighteen hours at most). In fracture cases, the importance of complete fixation and immobilization from the earliest possible moment can not be overestimated."

"The advent of primary wound suture, representing as it does a wonderful economy in time, money, and material, has brought about a striking change in surgery. Formerly, even after the deplorable stage of overwhelming septic wound contamination was past, a long time was required for the repair and cicatrization of wounds which healed but slowly under laborious aseptic dressings. Before the application of at least secondary wound suture had become a reality, large numbers of wounded soldiers had to be evacuated before their wounds were properly closed. The introduction of primary wound suture has greatly simplified modern wound treatment, which now consists essentially in passive supervision of the repair process, without dressings. The suture threads are removed on the tenth to the fifteenth day. At the end of three weeks, the patient is evacuated to the base hospital, or discharged on leave, according to the gravity of the condition."

"The suture method was gradually reached by Lemaitre in July, 1915, after successive phases of nonintervention, free exposure and surgical purification, complete

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excision of the entire wound track, fixation of microbes by means of iodine, and Carrel's method of multiple instillation. The original technique of wound suture has been considerably improved in the past three years. Filiform drainage by means of silkworm gut, removed in three or four days, is recommended on the basis of favorable experience. Minute asepsis and scrupulous hemostasis are indispensable, and radioscopy or operating on the radioscopic table are helpful adjuncts. When performed by experienced surgeons, primary closure by suture constitutes the ideal modern treatment of war wounds. The method needs no defense, for it is its own best vindication. Lemaitre aptly calls it a worthy daughter of French surgery, destined to live and prosper."

The description of the Carrel method is very good and is well illustrated. The following are the closing paragraphs of that section:

"While claiming brilliant results and supported by eminent surgeons, the Carrel-Dakin treatment is opposed by surgeons just as eminent. Thorough wound cleansing, with immediated suture, is held in high esteem and is undoubtedly the ideal method for treating many cases received at a very early stage. The use of other antiseptics besides the hypochlorites and the chloramines, either in conjunction with the Carrel method of instillation or without it, is also credited with successful results. Certain excellent authorities with large experience condemn the use of all antiseptics on the ground that they damage still further the injured tissues and contribute nothing to the healing process or the prevention of infection."

"The failure of so many able and honest men to agree upon a uniform method of treatment suggests the suspicion that each has hold of a thread of the truth but does not perceive the whole, which is that while much depends upon the sort of wound and the period when it comes under treatment, more depends upon the judgment and skill of the surgeon in first selecting the proper method for each particular case and then applying it."

"Personal observation in the war zone of the various modern methods of treatment, and the excellent results accomplished by many of them, leads me to accept the judgment of a growing number of surgeons that, while most of these methods have definite fields of usefulness, none of them is a panacea. The revival of the sixteenth century practice of immediate wound closure, with thorough debridement, is of undoubted value, and there is reason to hope that it will not again be relegated to the limbo of forgotten things, requiring rediscovery in wars to come. Meanwhile, the Carrel technique has come to stay, as through its employment certain great truths have been revealed. Asepsis, whenever possible, reinforced by antisepsis as required, is the keynote of success. The type of the antiseptic and the extent of its employment may be definitely determined by the future, but at present they are largely matters of individual opinion and preference."

Other methods of wound treatment described and discussed are: Hypochlorous acid preparations—eusol and eupad; salt pack method; dichloramine-T; magnesium sulphate; bipp—bismuth subnitrate or subcarbonate 1 part, iodoform 2 parts, paraffine in quantity sufficient to make a soft paste (Rutherford Morison's method); flavine; crystal violet and brilliant green; hypertonic solutions (lymphagogic agents); sunlight treatment of infected wounds; phenolization and embalmment of septic war wounds (Mencière's method); electricity; oxygen and ozone in war wounds.

The report gives some interesting information regarding the treatment of war wounds by the Germans, from which the following is quoted:

"The wound treatment then in use (1915) consisted in early long incisions, free drainage, and strong antiseptics, with invariable early splinting of fractures and immobilization of wounded parts. Their expert surgeons were stationed well up

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in the forward areas, so that they could decide what was to be done in each case. This method gave excellent results, since it enabled the wounded men to have the best advice when it was most needed. Severe abdominal wounds and head injuries were rarely moved back, and early treatment was instituted at the front in all cases in which it was thought advisable."

"In Germany, no one method of controlling wound infection seems to have been adopted to the exclusion of competitive procedures, as on the side of the Allies, where the Carrel-Dakin method of wound treatment has been so largely adopted. Although irrigation with dilute antiseptic solutions is employed by German surgeons, opinions vary widely as to the value of antiseptic agents. Irrigation with hydrogen peroxide has been extensively used in their military hospitals and is claimed to be especially efficacious in the treatment of infected fractures."

"Various chlorine-containing substances have been in use since early in the war, calcium hyperchloricum having been perhaps the most extensively employed. This has been used in a 1 or 2 per cent solution for bathing and irrigating wounds or, in combination with animal charcoal, magnesium sulphate, and bolus alba, as a dusting powder. In January, 1917, the *Correspondenz-Blatt fur Schweitzer Aerzte*, a Swiss periodical published in the German language, in an abstract from French original sources, brought the Carrel method of treating infected war wounds to the favorable attention of its readers."

"Other antiseptics advocated by German surgeons include Karlsbad salt; Leukason, a mixture of equal parts calcium perbolate and talc; pellidol, a substitute for scarlet red; liquid tar, etc."

"In opposition to the antiseptic method of wound treatment, and in anology with the physiological lymphagogic method indorsed by Sir Almroth Wright, some German writers on early wound treatment at the front have proposed the use of nitric salts, which on coming into contact with organic substances are at once reduced to nitrous salts. The object aimed at is to increase the hyperemia in these invariably infected war wounds and to produce a free flow of lymph."

"For fixation of the extremities in fracture cases, German surgeons make use of Cramer's wire splint and Volkmann's T-splint, femoral fractures being usually treated with extension apparatus. Plaster bandages are considered as unsuitable where a frequent change of dressings is required."

"Repeated plastic operations on the mouth and nose are recommended in the treatment of glancing gunshot injuries to the facial region. Soldiers with injuries to the jaw are transferred as soon as possible to the dentist for orthodontic treatment."

"Germany has given considerable attention to the after care of the wounded soldier, with a view to returning him to the ranks if possible, or, if he must be sent back to civil life, making him self-supporting and not a burden to the community."

"An interesting fact, possibly bearing on economic as well as surgical conditions, is that in 1915 and 1916 sawdust was being used as a dressing for many wounds instead of cotton. This was called 'scobitost.'"

The writer gives the following quotations from a summary of the observations made by Dr. H. M. Richter, of Chicago, who was for six months in 1916 in charge of a German base hospital:

"Carrel's treatment has been successful in relatively few hands. The numerous details to be observed in the preparation of the solution and its application probably offer an insuperable obstacle to its general use."

"The open treatment of infected wounds forms the simplest and most convenient method of handling patients in large numbers."

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"The routine tubbing of patients with infected wounds, irrespective of the parts involved, gives remarkable and instantaneous comfort to the patient, and controls suppuration more rapidly than any other method at our disposal, its field of usefulness being limited only by lack of facilities, under ordinary military conditions."

Commander Bainbridge closes this section with the following paragraph:

"In closing this section it may be of interest to point out two contrasts which must strike forcibly anyone who is conversant with the facts. The one contrast lies between the marvelous efficiency of Germany at the outbreak of the war and the conditions, best described as chaotic, which existed at that time among the Allies. The other contrast, more gratifying to us, is shown when we compare those same conditions with the truly wonderful improvement to be found today on the side of the Allies."

Under the head of "Developments of War Surgery" the subjects of anesthesia, joint lesions, fractures, trephined cases, amputations, and plastic and oral surgery are discussed. The section is very well illustrated and contains much valuable information. The reports of various boards and the opinions of eminent surgeons are embodied in the text. The description of the reconstruction work of Delagénière is especially interesting.

The section on trench fever is an epitome of the mode of dissemination and the prophylaxis of that disease. The work of the investigating committee headed by Maj. Gen. Sir David Bruce, the investigations of the problem of louse eradication by Dr. Peacock, and the research work on the bionomics of the louse by Professor Nuttal are referred to and their reports quoted.

The subject of "Care of Wounded from Firing Line to Convalescent Camp" is thoroughly described, discussed, and illustrated under the following sub-headings: Surgery of the forward area, and transportation of the wounded; Special notes on some of the hospitals visited; Military hospitals visited; Convalescent camps. The author's notes on the hospitals and his conversations with the eminent medical officers in the service of the Allies contain much valuable data. He observed, among others, the work of Crile, Carrel, Tuffier, Depage, Pozzi, Chutro, Moynihan, Blake, Cabot, and Cushing.

The functional and vocational reëducation of the wounded is touched upon in a well-illustrated section. Several of the French schools devoted to this purpose are described.

Under the heading, "Conferences of Surgeons," are presented the conclusions adopted by the Inter-Allied Surgical Conferences held in Paris, March and May, 1917, regarding the general principles guiding the treatment of war wounds. It is regretted that lack of space prevents the giving of an abstract of these valuable papers.

The report is concluded with an elaborate and carefully illustrated description of Professor Pedro Chutro's technique of cartilaginous cranioplasties.

FRANCIS M. MUNSON.

Repair Park Operation. Instructions for the use of Officers and Men of the Motor Transport Corps. Central Printing Plant, A. E. F., 1919.

Regulations for Standard Motor Vehicle Operation. A. E. F.

Manual of the Motor Transport Corps. A. E. F.

These three books issued by the American Expeditionary Force cover, in an exhaustive fashion, the service by Motor Transport and are evidence of the important part which it played in the war.

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The Motor Transport Corps Manual is of general character, covering all of the common ground of the corps in which the administrative personnel, the maintenance personnel and the operation personnel were alike interested. The Instructions for Repair Park Operations cover primarily the field of the maintenance personnel, while the Regulations for Standard Motor Vehicle Operation cover to a more limited extent the field of the operating personnel. This Motor Transport Corps Manual covers that portion of the work of operating personnel which had to do with camping, billeting, caretaking of vehicles in parks, despatching methods, pooling arrangements, etc.

The many details of the complex duty are clearly dealt with and there is interest in the subject-matter not only for the specialist in this branch but also for the casual reader.

J. R. C.

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BOOK REVIEWS

Leishmanioses, Kala Azar. Bouton d'Orient Leishmaniose Americaine, Par. A. Laveran. Paris: Masson et Cie, 1917. Pp. iii+521, 6 plates, 40 figures in text.

It is only sixteen years since Leishman and Donovan made their initial discovery that a protozoan was the etiological agent in the puzzling and till then unsolved disease of kala azar. Since 1903 a literature comparable in extent and volume with that relating to dysentery and almost to that of malaria has grown up, largely in British, French and Italian journals, since kala azar or visceral leishmaniosis and oriental boil or cutaneous leishmaniosis are endemic in British and French colonies and in the circum-Mediterranean area. It is eminently fitting that one of the leaders in these investigations, the veteran protozoölogist of the Pasteur Institute of Paris, Dr. A. Laveran, should critically review the present state of knowledge of these diseases and present his conclusions in his work on "Leishmanioses."

The etiological agent in these diseases is a flagellate, *Leishmania*, similar in morphology to the *Crithidia*, a widely distributed flagellate of the digestive tract of biting insects such as the Hemiptera and Diptera, and one rather closely related to the trypanosomes. In the human tissues or fluids the organisms are aflagellate, rounded or pyriform bodies in multinucleate plasmodial masses. With each nucleus there is associated a single blepharoplast. When such bodies are taken into the digestive tract of the insect or are inoculated into *nnn* culture medium they become therein typical flagellates.

Kala azar or visceral leishmaniosis has been detected in eastern India, Ceylon, northeastern China, Russian Asia, Turkestan, Asia Minor, Egypt, Abyssinia, the Soudan, Tripoli, and Algiers. On the northern coast of the Mediterranean it is endemic in southern Italy and Sicily, Greece, Malta, Spain and Portugal. Canine visceral leishmaniosis occurs also in most of the countries enumerated. There is lack of agreement as to the identity of the parasites producing the two diseases. The weight of the morphological, distributional, clinical, and serological evidence favors their identity, but experiments in cross immunity and more critical observations on the rôle of dogs in the spread of the disease are needed to decide the question.

The propagation of leishmanioses by blood-feeding insects is suggested by the occurrence of *Crithidia* naturally in such insects and their non-hematophage relatives, by the experimental production of flagellate infections in vertebrates by such flagellates of insects, by the presence of *Leishmania* in the peripheral blood, and its experimental transfer by insects from one mammal to another. However, digestive troubles and alterations in the intestinal mucosa also suggest that the digestive tract may be the portal of entry of the flagellate, and, moreover, leishmaniosis never spreads with the rapidity and intensity of some insect-borne diseases such as malaria and trypanosomiasis. The Hemiptera, especially the bedbug and the kissing bug (*Conorhinus*), have been under suspicion, and the former has been experimentally infected by *Leishmania*, but attempts to infect mammals by the bites of the infected bugs generally fail. In the reviewer's opinion, based on the occurrence of spores of *Crithidia* in the rectum of plant-feeding Hemiptera, the most promising field of experimentation lies in infection by viable spores in the feces of the blood-feeding insects, especially of the bedbug. Fleas will sometimes transfer *Leishmania* from dog to dog under experimental control, and Franchini has infected mosquitoes with this

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flagellate from spleen punctures, but Patten in Madras got negative results with mosquitoes fed on kala azar patients. Efforts to incriminate the house-fly and ticks have been unsuccessful. Acton's recent summary of the loci of infection suggests the agency of *Phlebotomus*. From all of the available evidence it seems not improbable that the mode of infection is limited to conditions which are infrequently realized, and that this may be by means of certain stages in the fresh feces ingested with the insect or rubbed into the fresh wound made by the insect.

Cutaneous leishmaniosis, Bouton d'Orient, tropical ulcer or oriental sore, was discovered by Dr. J. Homer Wright in Boston in 1903. It is not permanently a disease of this country but is introduced from the Mediterranean area, where it is endemic in nearly all lands bordering that sea. It occurs in Asia Minor, in semi-arid Russian Asia, northwestern India, and Assam. In Tunis and India its area is distinct from that of kala azar. It is found also in dogs and may be inoculated into dogs, cats, monkeys, rats, mice, and guinea-pigs and some other rodents, but not in other domestic animals. In morphology the flagellate of this disease closely resembles that of kala azar, but the clinical manifestations are quite distinct.

A form of this disease known as American cutaneous leishmaniosis presents certain clinical differences, although the flagellate is morphologically similar to *Leishmania tropica* of tropical ulcer of the Mediterranean area. It affects primarily the mucous membranes of the nasal-bucco-pharyngeal region, producing there extensive lesions unlike those of *L. tropica*. This disease occurs in tropical South America, Panama, Martinique and Yucatan.

Travel, commerce and immigration all tend to bring these diseases to our shores, and the extension of American shipping and commerce in the near future will increase the opportunities for their access to this country.

CHARLES A. KOFOID.

HUMAN INTESTINAL PROTOZOA OF THE NEAR EAST. An inquiry into some problems affecting the spread and incidence of intestinal protozoal infections of British troops and natives in the Near East, with special reference to the carrier question, diagnosis and treatment of amebic dysentery, and an account of three new human intestinal protozoa. Conducted under the auspices of the Medical Advisory Committee, M. E. F. (January to August, 1916). By Lieut. Col. C. M. Wenyon, R. A. M. C., and Capt. F. W. O'Connor, R. A. M. C. Published for the Wellcome Bureau of Scientific Research by John Bale, Sons and Danielsson, Ltd., London, England, 1917. 10s. 6d. net.

This work is a reprint of a series of articles published in volume 28 of the Journal of the Royal Army Medical Corps, 1916, with additions and corrections, a paper on "The Carriage of Cysts of *Endameba histolytica* and other intestinal protozoa and eggs of parasitic worms by house-flies, with some notes on the resistance of cysts to disinfectants and other agents," from the same journal, and an appendix with a series of clinical histories of cases.

The book is the direct result of intensive practical field work involving many continuous observations of patients, and a wide range of material, and has in consequence exceptional value as an original contribution. The most striking contribution is the description of a new parasitic endameba of man, *Endameba nana*, which appears to be one of the commonest intestinal amebas and to have been one of

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the confusing factors in this much confused field of investigation. It is reputed to be non-pathogenic and has been found by the reviewer to be very abundant both as to infections and as to individuals in both home service and overseas troops of the U. S. Army.

Among the many valuable interesting conclusions reached are the following. A single fecal examination reveals about one-third of the infections brought to light by repeated examinations. In healthy British troops the percentage of infections by *E. dysenteriae* was 5.3. Attacks of diarrhea tend to rid the intestine of amebae temporarily, and thus apparently reduce percentages. Native prisoners showed 13.5 per cent infection with *E. dysenteriae*. Natives serve as reservoirs of infections. Rats, mice, and cats serve as reservoirs of infections with *Trichomonas* and *Giardia*. The majority of carriers of *E. dysenteriae* appear to be perfectly healthy.

The authors give instructive details of the difficulties attending the microscopical diagnosis of the ameba of dysentery from other amebae and body cells, and conclude that the only safe clues are active amebae with included red blood corpuscles, or typical four-nucleate cysts of *E. dysenteriae*. The former occur in acute dysenteric phase, but the latter in the indolent ulcerative or carrier phase of amebiasis. Carriers may remain apparently healthy for years and even never have any history of acute dysentery, though it appears probable that such carriers may have some ulceration of the large intestine. Acute dysentery may initiate the infection or may appear at any period with large amebae with ingested red blood cells, and be followed by prolonged or intermittent periods of the carrier phase when only small free amebae, if any, are found in the stool, and cysts also appear in the stools. In a few long-standing cases very small cysts were found.

The authors are conservative with regard to the pathogenicity of intestinal flagellates. They regard *Giardia* (*Lamblia*) as having the best claim to pathogenicity. It occurs in greatest abundance in certain types of diarrhea with stools of characteristic yellowish mucus. Many healthy carriers of this flagellate were found as also of *Chilomastix mesnili*, a flagellate which Chalmers and Pekkola find abundantly in the Soudan in certain diarrheas. Two new flagellates, *Tricercomonas intestinalis* and *Waski intestinalis*, are described. The latter appears to belong in the genus *Embadomonas*.

The authors clearly incriminate the house-fly as a carrier of human protozoan and worm infections. Flies feeding upon infected feces carry cysts of protozoans and ova of intestinal worms unaltered by their digestive juices and void them in their excrement, it may be, in five minutes after feeding. Some flagellates may survive this rapid transit. The non-feeding fly may carry these infections for as long as forty-eight hours. A large percentage of wild flies having access to feces have been found on examination to be carrying infected material. A fly will eat one milligram of feces in a half-hour. Cysts of *Endameba dysenteriae* survive in water for at least a month, provided the feces are diluted, but drying kills them promptly. Cresol in 1 to 10 solution kills them promptly when mixed with an equal volume of feces, but free chlorine in 1 to 10,000 is without effect. Chlorinated lime used in water sterilization is without effect upon the cysts.

This work is indispensable to every clinical microscopist working with these infections and contains some data on the use of emetin. Best results were obtained with combined subcutaneous injections and oral administration of drug. The later development of the now much used double iodide of bismuth and emetin is unfortunately not contained in the book.

CHARLES A. KOFOID.

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Mess Officers' Manual by Several Officers of the Division of Food and Nutrition of the Medical Department, U. S. Army. Illustrated. Philadelphia: Lea and Febiger. Price, $1.50.

This little book of 190 pages may easily be carried in the pocket, but, owing to the good judgment shown by the authors in their selection of material and to their conciseness of expression, the amount of information and practical advice contained in it is out of proportion to its small size. An idea of its contents may be gained from the chapter headings which are: Composition of Foods; Selection and Inspection of Foods; Storage of Foods; Digestion and Absorption of Foods; Nutritive Value of Foods and Their Use in the Diet; Kitchen Economy and Mess Management; The Duties of Mess Officers, Glossary.

Three of the chapters deal with the scientific aspects of nutrition and give in a concise, but at the same time a clear and an interesting form, an account of such portions of this subject as are necessary for an intelligent appreciation of the problems involved in the planning of a satisfactory diet. These chapters are the ones of most general interest, and could be read with profit by anyone who desires in a non-technical form a brief outline of the essentials of human nutrition. Three of the remaining chapters deal with practical matters of more or less general application, and, while the needs of the Army are here kept in the foreground and receive adequate attention, there is much advice on subjects such as the selection of food, the detection of food spoilage, the care of the refrigerator, the use of left-overs, etc., which would be equally useful in any household or civilian institution. In only one chapter—that dealing with the duties of mess officers—is the point of view purely military, and, since this chapter is but eight pages in length, it is apparent that the use of the book need by no means be restricted to army officers.

In addition to the text, there may be mentioned as other features of value a set of working drawings for the construction of a bread box; a vegetable bin, and a sterilizer for dishes, all superior to those in common use in the Army at present, and a useful table of food values, based on the well-known tables of Atwater and Bryant, but arranged so as to lighten the work of making computations and generally adapted, by the incorporation of a number of new analyses and otherwise, to the needs of army messes.

M. H. Jacobs.

Roentgen Interpretation, a Manual for Students and Practitioners, by George W. Holmes, M.D., Roentgenologist to the Massachusetts General Hospital and Instructor in Roentgenology, Harvard Medical School; and Howard E. Ruggles, M.D., Roentgenologist to the University of California Hospital and Clinical Professor of Roentgenology, University of California Medical School. Illustrated with 181 engravings. Philadelphia and New York: Lea & Febiger, 1919.

An excellent volume, the work of two well-known men, each of whom has had extensive experience in Roentgen diagnosis.

The introduction is especially valuable, emphasizing in a very lucid manner the various pitfalls and errors surrounding the subject. Regarding the practice of attempting to render opinions based upon a single plate of any portion of the body, the authors remark: "One view is an isolated observation and is perhaps less to be relied upon than a single observation in any field of medicine."

Warning is also given against the practice of expressing opinions based upon poor plates.

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Sufficient space is given to a consideration of anatomical variations, confusing shadows, and artefacts.

The volume is profusely illustrated. The majority of the cuts are excellent.

Appended to each chapter is a carefully selected and extensive bibliography, covering the subjects discussed in the preceding pages. This feature is of very great value.

In the reviewer's opinion, the value of this work entitles it to a more pretentious setting.

GEORGE C. JOHNSTON.

PULMONARY TUBERCULOSIS, by Maurice Fishberg, M.D. Second edition. Illustrated. Philadelphia and New York: Lea & Febiger, 1919. Price, $6.50.

In the preface the author refers to the manner in which the tuberculosis problem has been handled in the armies of the late war, and points out that, although clinically apparent, tuberculosis has for the most part alone been considered a cause for the rejection of the individuals concerned and tuberculin has not been applied for diagnostic purposes at all; the fear felt by many that tuberculosis would prove a serious menace has not been realized, the number of cases of active tuberculosis not having been excessive considering the fact that the large majority of soldiers are in the most susceptible age period. This, he says, is an experiment on a large scale, which shows among other things that tuberculosis is not transmitted by one adult to another, and which fully confirms the "rather unconventional" views on the diagnosis and prophylaxis of the disease which were expressed in the first edition. That a second edition should be so soon required is the best evidence that the work has met with the favor which it deserves. The present edition is much enlarged and nearly every chapter has been revised. The author has a very wide acquaintance with the enormous mass of literature which relates to tuberculosis, and his work is not only a storehouse of facts but of great value as a book of reference to the bibliography of the subject.

The views which Dr. Fishberg modestly calls "unconventional" are those of the school of Romer, Much and Calmette. Their views as to the relation of acquired immunity to the course of tuberculous infection are not as yet the views most widely held in this country but are gaining ground rapidly. The chapter on Phthisiogenesis (Chapter V) gives an excellent presentation of these doctrines, which, though they may not solve all the perplexities of the difficult subject, furnish in general the most satisfactory and practically useful conception of the disease. It is a pleasure to find a systematic writer on tuberculosis who has the courage of his convictions. One is rarely in doubt as to the position of the author with regard to the very numerous subjects which he discusses. The work is to be highly commended to all those who wish to acquaint themselves with the present status of phthisiology.

G. E. BUSHNELL.

RULES FOR RECOVERY FROM TUBERCULOSIS, by Lawrason Brown, M.D. Third edition. Philadelphia and New York: Lea & Febiger, 1919. Price, $1.50.

The author is well known as one of the most prominent tuberculosis specialists of the day. The work, which is intended for the use of the layman, has received a wide circulation in its previous editions, and the appearance of the third edition is the best evidence that it meets a want and has proved useful. As would be expected from their source, the suggestions are practical and judicious and cover the subject with sufficient detail to furnish a guide to those patients who have not the benefit of

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the advice of a competent physician. Emphasis is laid upon the importance of avoiding indiscriminate stuffing, and the aim in gaining weight is stated to be to regain the usual weight of the patient and perhaps to exceed it somewhat. The usual weight, or what is often called the normal weight of the patient, is not the same as the average weight for his height and age. This point is commonly overlooked by the patient, who is usually despondent if he does not easily reach this average, and too often forces the feeding. This not only may lead to injury of the digestive organs but, if the individual is of the tall, thin type and succeeds in attaining his object, results in the accumulation of unnecessary and undesirable fat. One who weighs the author's words will be rightly guided, but the "Weight Tables" which are furnished mislead so many that the reviewer doubts the expediency of including them in a work of this kind. It is to be hoped that many will in time take to heart the teachings of this little work, for, to reproduce a quotation cited by Dr. Brown, "In pulmonary tuberculosis the notes of personal experience mature too late and cannot be discounted."

G. E. Bushnell.

The Surgical Clinics of Chicago. Volume III, Number 2, April, 1919. Philadelphia and London: W. B. Saunders Company.

The April number of these Clinics maintains the excellent standard developed in this publication.

Several papers are worthy of special notice: among them are two by Wyllys Andrews, one, "Cholecystectomy and the Management of the Proximal Stump of the Cystic Duct," and another, "Multiple Drilling of Fractures—An Old-fashioned Operation Revised."

Ochsner, as usual, has papers of practical value, and Bevan one on Appendicitis in which he gives an exceedingly comprehensive review of the subject. This paper, if carefully studied by those whose life experience has not kept them in touch with the subject during its evolution, will not only increase their knowledge but also make them safer surgeons. Doctor Bevan has no superior as a teacher of surgery in this country.

There are other papers in this number which contribute to the keeping-up of the excellent reputation of the Chicago Surgical Clinics.

Jno. E. Summers.

The After Treatment of Wounds and Injuries, by R. C. Elmslie, M.S., F.R.C.S., Brevet Major R. A. M. C. (T. F.), Special Military Surgical Hospital, Shepherd's Bush; Surgeon-in-charge of the Orthopedic, Physical Exercise and Massage Departments, St. Bartholomew's Hospital; Surgeon to Out-patients, Metropolitan Hospital; Orthopedic Surgeon to Queen Mary's Hospital, Roehampton; Consulting Orthopedic Surgeon to the Foundling Hospital and National Children's Home and Orphanage. Philadelphia: P. Blakiston's Son & Co., 1919. Price, $4.00 net.

This excellent book, written by an orthopedic surgeon, discusses principally subjects which before the war were regarded as belonging to the domain of general surgery. For instance, there are chapters upon the Treatment of Chronic Osteomyelitis, Mal-Union of Fractures, Delayed Union and Non-Union of Fractures, Injuries of the Nerves, Injuries of the Muscles, Tendons, and Skin, Amputations, and others.

Some specialties are expanding, as in the instance of orthopedics; while others

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are more noticeably splitting up, to the detriment, too often, of the public. *Apropos* of this, Sir William Osler, in a recent address, says: "The extraordinary development of modern science may be her undoing. Specialism, now a necessity, has fragmented the specialities themselves. The worker loses all sense of proportion in a maze of minutiae. Applying themselves early to research, young men get into backwaters, far from the main stream. They quickly become hypercritical, and the smaller the field the greater the tendency to megalocephaly. From over-specialization, scientific men are in a more parlous state than are the Humanists from neglect of classical tradition. The salvation of science lies in a recognition of a new philosophy—the scientia scientiarum which Plato describes: 'Now, when all these studies reach the point of intercommunion and connection with one another, and come to be considered in their mutual affinities, then I think, and not till then, will the pursuit of them have value.'"

Within the limits of the subjects treated, this book will compare most favorably with other publications.

The progressive general surgeon would find Dr. Elmslie's book more helpful if he had devoted himself to a more elaborated exposition of the chapter on Physiotherapy. Only fourteen pages are given to this most important part to be played in the after-treatment of wounds, viz., Hydrotherapy, Treatment by Massage, Treatment by Passive Movements, Treatment by Active Movements and Exercises, Electrical Treatment, Functional Reëducation by Work—under all of these headings will be found brief but common-sense advice. There should be more of it.

JNO. E. SUMMERS.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interest of our readers and as space permits.

1918 COLLECTED PAPERS OF THE MAYO CLINIC, ROCHESTER, MINN. Octavo of 1,196 pages, 442 illustrations. Philadelphia and London: W. B. Saunders Company, 1919. Cloth, $8.50 net.

THE SURGICAL CLINICS OF CHICAGO. Volume 3, No. 3. Philadelphia and London: W. B. Saunders Company, 1919.

ON GUNSHOT INJURIES TO THE BLOOD-VESSELS, founded on experience gained in France during the Great War 1914–1918. By George Henry Makins, G. C. M. G. C.B., Honorary Major-General and late Senior Consulting Surgeon to the British Expeditionary Force in France. New York: William Wood & Company, 1919. Price, $5.50.

GENERAL SURGERY. Volume II. By Albert J. Ochsner, M.D., F.R.M.S., LL.D., F.A.C.S. Chicago: The Year Book Publishers, 1919. $2.50 per volume; series of eight volumes, $10.00.

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INSTRUMENTS AND APPLIANCES

THE PRACTICAL APPLICATION OF AUSCULTATORY PERCUSSION BY CONTINUOUS VIBRATION

By A. A. Surgeon JOHN P. HICKEY
United States Public Health Service

(With five illustrations)

The following letter was forwarded to this office from the Surgeon General, U. S. Army, together with the descriptive booklet published by Dr. Hickey. The entire text of this booklet is more than can be properly published in the pages of this magazine, but we have extracted that which follows as sufficient to indicate the use and scope of the vibrator referred to in Colonel Fauntleroy's letter.—The Editor.

1. Some time in December, I forwarded through the Surgeon General a booklet illustrating the application of an electrical vibrator devised by Dr. John P. Hickey, for the purpose of auscultatory percussion. At the same time I called attention to the special usefulness of this vibrator in facilitating the quick and accurate detection of pathological increase in density in lung tissue, the position and size of the heart, spleen, liver, kidneys and other abdominal viscera; and also, the detection of obscure fractures.

2. As there has been no mention made of this valuable little instrument in The Military Surgeon, I venture to recall my communication to you, with a view to inviting the attention of the profession to this very useful means of diagnosis.

3. Now that recruiting for the Army has begun again, attention is especially invited to this vibrator for the detection of disqualifying defects in applicants. By this instrument the increase in density in the lung tissue can be detected long before it is possible to detect it by the digital method. The accurate outline of the heart, spleen, liver, kidneys and other abdominal viscera is far more easy, and thus the detection of abnormal positions and changes in these organs can be quickly and positively made, and the essential information obtained in determining for the acceptance or rejection of the applicants. The interpretation of X-ray plates is made more easy by this vibrator, especially where there is doubt as to the existence of the shadow, the vibrator corroborating it in the presence of tissue density.

4. Such diseases as paragonimiasis have been detected by this vibrator, together with examination of the sputum and finding in it the ova of the parasites. The results of a previous infection, after the parasites had become extinct, has also been detected by this vibrator.

5. The usefulness of the instrument will be readily suggested upon reflection, and hence no further mention need be made at this time. There seems to be no doubt that the ordinary physical examination failed to show tuberculosis in about 20 per cent of all men examined, and when so detected, it was always readily shown by the X-ray plates. By means of this vibrator, tubercular changes can be detected long before they can be made out by digital percussion, and hence by means of

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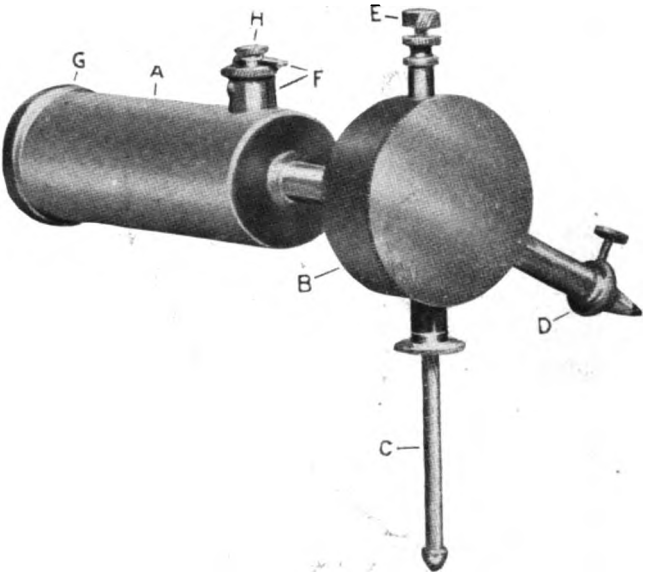

FIG. 1.—The instrument comprises a handle (A) and a head member (B) with an electric vibrator within the head connected with a source of current supply contained within the hand piece. Through the staff (C) the vibrations are adapted to be transmitted to the surface of the body. The outlines of the organs are marked on the surface with the pencil attachment (D). A screw (E) is provided to adjust the vibrator. The switch and locking device (F) permits of opening and closing the current through the vibrator. The battery is removed from the hand piece by unscrewing the end piece (G).

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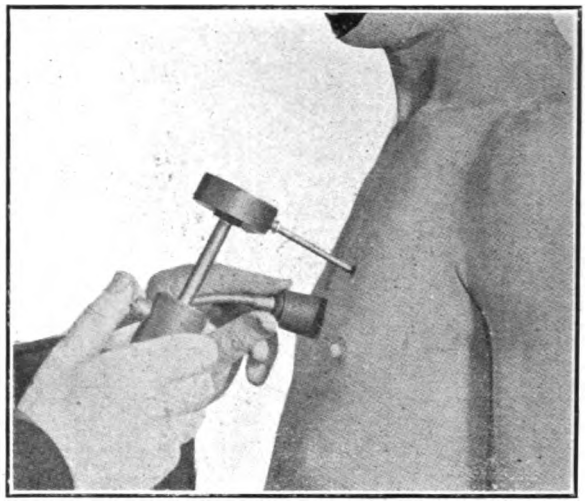

FIG. 2.

FIG. 3.—SHOWING THE MANNER OF HOLDING THE VIBRATOR.

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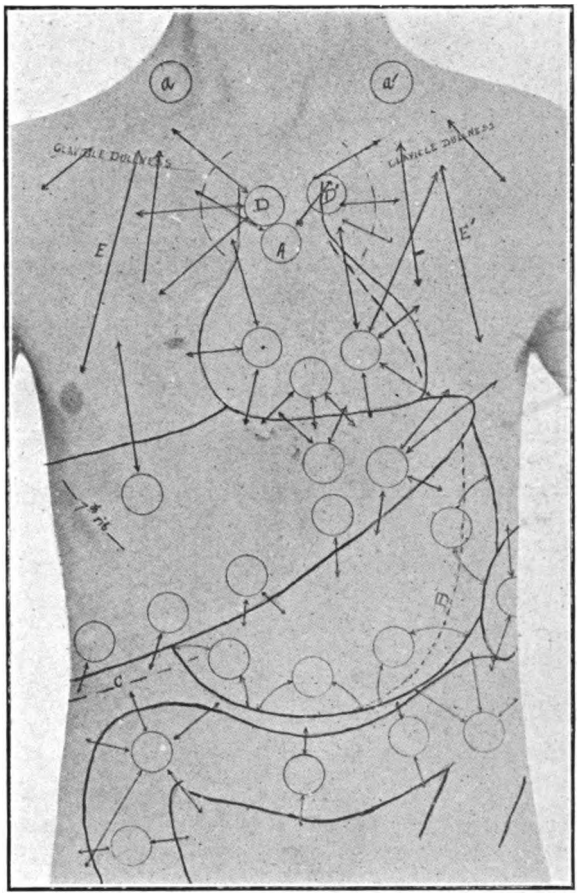

FIG. 4.—THE GENERAL SCHEME FOR USING THE VIBRATOR (Diagrammatic).

The vibrator is to be moved in the directions indicated by the arrows; the chest piece of the stethoscope being placed over the circles.

a, á. Placement of the stethoscope when examining the lungs.

D, D'. When mapping out mediastinal "dulness."

E, E'. Along these lines, as a rule, changes in pulmonary densities will usually be found. When the vibrator is placed over the clavicle there will be produced a distinct increase in the intensity of the sound, due to the clavicle, while immediately below this point, should there be no infiltration, there will be only a faint sound heard while the staff of the vibrator is moved slowly and lightly applied upon the surface.

B. The usual position of the line found when delimiting the greater curvature of the stomach.

C. The lower limit of liver "dulness" made out during arrested deep inspiration with the body bent backward.

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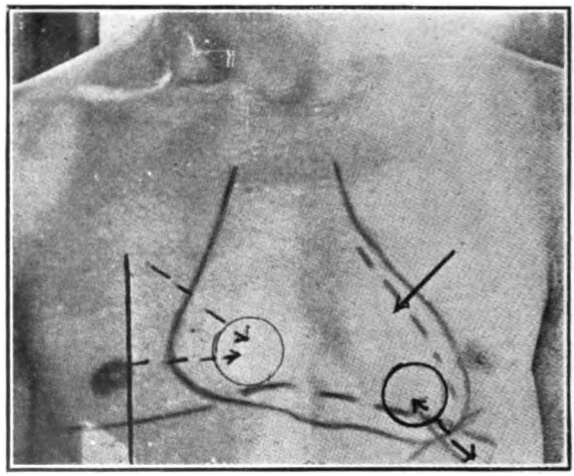

FIG. 5.—TRICUSPID INCOMPETENCY.

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vibratory percussion, the large number of errors made by the ordinary physical examination can be largely eliminated in the examination of applicants for the service. From an extensive personal use of this instrument in the examination of applicants and drafted men, I feel justified in stating that this vibrator will do all that Dr. Hickey claims for it.

P. C. FAUNTLEROY,
Department Surgeon.

Vibratory auscultatory percussion differs but slightly from the method of auscultatory percussion that was first described in 1840. The claims for the newer method, as will be seen, are not in excess of those advocated at that time, with the possible exception that the vibratory technique will detect impairments of pulmonary resonance, though possible but difficult by the older method. With the exceptions of certain limitations to be mentioned later, the method of auscultatory percussion, using continuous vibration, instead of blows being struck with the fingers or hammer, will be found to possess many advantages over other methods, its relative value to diagnostics being all that a more precise method of percussion may stand for.

Several photographs have been introduced, which will illustrate the technique and at the same time show its applicability to varied conditions.

The method of auscultatory percussion, as described by Camman and Clark (1840), had the following claims made for it:

1. That the heart can be measured in all but its anterior-posterior diameters, under most, perhaps all circumstances of health and disease, with hardly less exactness than we should be able to do if the organ were exposed before us.

2. That the outlines of the liver can be traced with much greater certainty than by ordinary percussion in circumstances of health; and to circumscribe it in many conditions of disease in which ordinary percussion is not applicable.

3. That the dimensions of the spleen can be ascertained in circumstances that baffle ordinary percussion.

4. That by it we can mark the superior, inferior, and external limits of the kidneys. Ascites presents no obstacle to the measurements of these organs; and from enlarged spleen the left kidney is easily distinguished. . . . .

In recent times writers have commented favorably regarding auscultatory percussion, as may be seen from the following quotations taken from standard text books on diagnosis:

. . . auscultatory percussion is a valuable means of defining the exact outline of a dull area, as an aneurism, or tumor within the chest, or determining the limits of organs even of similar nature. . . . MUSSER.

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. . . It is a sufficiently useful method to deserve a much wider use than it has yet attained.

Its particular application is to determine the outlines of either solid or air-containing organs. BUTLER.

This refers to the practicing of auscultatory percussion by digital means, or with a hammer.

The vibrator imparts vibrations that are continuous, following each other in rapid succession, permitting of forcing the underlying structures into vibration. It is to this fact that the possibility of outlining the heart borders with emphysematous lung tissue intervening is attributed, and also the determining of increases in density of lung tissue.

It is not advisable to adhere too closely to set rules in describing the technique as more or less latitude will have to be left to individual users, to vary the technique as physical conditions may require, the most to be expected being a general description of the application of the fundamental principle.

Rather than displacing ordinary percussion, the vibratory method will be of assistance to beginners, by teaching them to recognize the various degrees of impairment of resonance by first pointing it out and also aid those with defective hearing.

With a few changes, the technique for ordinary auscultatory percussion may be applied to the vibratory method, which consists in placing the chest piece of the stethoscope upon the surface overlying the organ to be delimited, holding it in position with the left hand (see Fig. 2), while the vibrator is manipulated with the right hand (see Figs. 2 and 3).

One begins by placing the staff of the vibrator upon the surface, at some distance outside of the presumable limits of the organ, and moving it in the direction of the stethoscope (see Fig. 4). When the border of the organ is attained, there is a noticeable increase in intensity, an elevation in pitch, and perhaps a slight alteration in the quality of the sound. The vibrator is to be moved along lines, that are carried radially from various points encircling the organ, to the stethoscope as a center. If the exact spot on each line at which an alteration in sound occurs is marked, and these marks subsequently joined by a continuous line, an outline of the organ will have been obtained. The double-pointed arrows shown in the accompanying figures indicate that the vibrator is to be moved in two directions: the arrows with the broken shafts, indicate that the vibrator staff is to be applied lightly upon the surface.

The technique will have to be varied somewhat, depending on whether an organ is deep or superficially situated, and, when dealing with the lungs, as to whether the infiltration is of greater or lesser degree.

The varying of the technique will have to do with the amount of

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pressure applied through the staff, upon the surface of the body, being analagous to the varying of the force of the blow struck, with the fingers, when practicing ordinary percussion. The lighter the staff of the vibrator is applied upon the surface, the more definite will be the result.

As a rule, sufficient pressure should be exerted to make a faint sound audible through the stethoscope, with the staff placed somewhat outside the area of dullness.

The vibrator may be manipulated in several ways as the physical conditions may suggest:

1. Place the stethoscope over an organ and move the vibrator from various points toward the stethoscope.

2. Place the stethoscope over the organ and move the staff of the vibrator *from* the stethoscope toward the periphery of the structure.

A combination of these two maneuvers will be found most satisfactory.

FLY EXTERMINATION

By Major GEO. L. A. DALE, M. C., U. S. A.

(With five illustrations)

The following letter is published for the information of those interested in fly extermination:

HEADQUARTERS
CAMP DODGE, IOWA

Office Camp Surgeon
July 20, 1919.

Editor Military Surgeon,
Army Medical Museum,
Washington, D. C.

Sir: In planning fly control for the present season, two features, somewhat different from past methods, were decided upon to increase efficiency.

Each organization, as formerly, provide and care for all wire issue traps, sticky fly ribbons and other devices inside of buildings only.

The Camp Sanitary Squad constructed a model of a large improvised fly trap from wire and wood and furnished a pattern to each organization. Each organization was directed to make for itself the required number, but had nothing to do with the after-care.

The camp surgeon directed that these large improvised fly traps be provided in the following numbers for the points designated:

(*a*) At each stable of a regiment or other organization.....10
(*b*) At each stable or corral in a remount station.....20
(*c*) At each veterinary hospital.....25
(*d*) At each cantonment garbage transfer station.....25

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(e) At each manure loading station.....25
(f) For each garbage can platform at each mess..... 4
(g) For each door of each kitchen and mess room of a company or organization..... 2
(h) In each lavoratory building or pit latrine shelter..... 2
(i) At each door of each bakery..... 2
(j) In and about each exchange of a regiment or an organization...12

The Camp Sanitary Squad, provided with truck, fly bait, broom, saw and hammer, takes entire care of these outside traps. Each is visited daily, rebaited and repaired, if found defective, thus insuring constant functioning of all traps.

Once every two weeks each trap is sprayed with a mixture of four parts coal oil and one part denatured alcohol, killing any flies which may be alive. The traps are opened and the flies deposited into a garbage can carried for the purpose. At the end of the trip they are dumped on the ground and lighted with a match. Incineration is quick and complete because of saturation with the inflammable insecticide. Captured flies are removed only every fourteen days, because it was found that considerable numbers acted as an added attraction to the regular bait.

The old fly baits, such as fish or sugar and vinegar, are not employed, because these products are expensive and, when used in amounts as required for daily replacement, the cost to the Government is astonishingly great.

Experiments with different wastes which cost the Government nothing revealed the fact that banana peels and pulp, unsuitable for consumption, canteloupe and watermelon rinds excelled as bait.

When these are insufficient in quantity, they are added to any wet mixed garbage obtainable at the incinerator plant.

The present number of 507 large outside improvised fly traps receive daily care by experienced men responsible to the camp sanitary inspector only. This centralization of control and care has resulted in the capture and destruction of enormous numbers of flies and a satisfactory decrease of those at large. The removal of wastes and employment of larvacides over likely breeding areas play a regular part in the fly control at this camp.

As educational and inspirational effort at coöperation, the following matter was displayed on placards in all halls, depots, barracks, mess halls and kitchens. One thousand of these placards were distributed throughout the Cantonment.

KILL THE FLY

HOUSE FLY IS ALWAYS DANGEROUS

The war strain and influenza epidemic have undoubtedly lowered the natural resistance of the people temporarily, and the inhabitants are likely to be more susceptible to summer diseases therefore.

The open winter has favored fly propagation.

One fly killed now means millions less later on.

The female fly lays 150 eggs at one time.

She produces six batches in 5 weeks time, her life period.

The possibilities of spreading infection by millions and trillions of flies from such enormous increase is self-evident.

Presence of flies in mess halls, kitchens, exchanges and lunch rooms is evidence of neglect and dirt.

Refuse to patronize a restaurant or soft drink parlor if flies are permitted access to food and drink.

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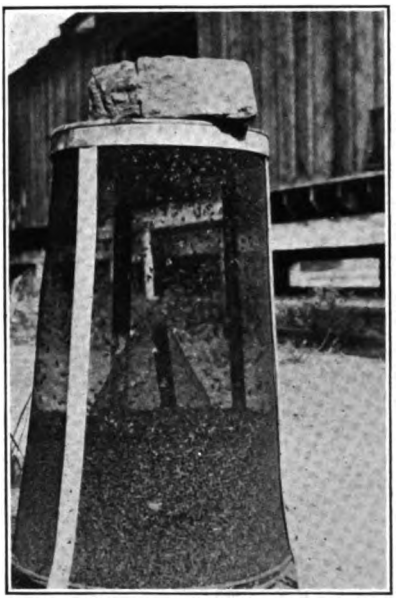

WATERMELON RIND FOR BAIT.

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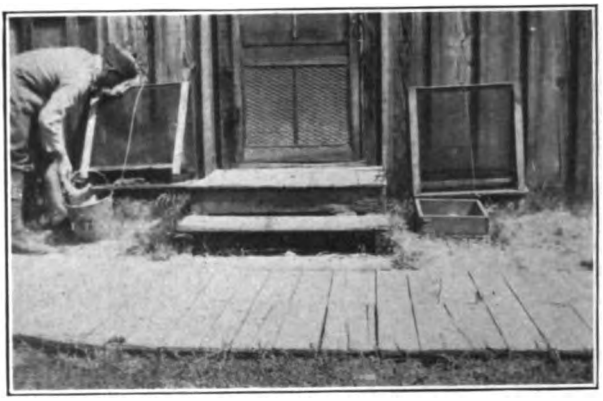

Baiting Traps at Kitchen Door.[4]

Estimated 200.000 Flies from Eleven Traps.

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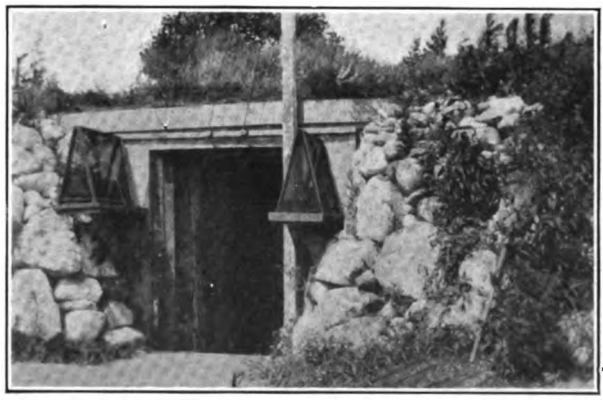
PROTECTING GARBAGE STAND.



FOOD STORAGE CELLAR—REMOUNT STATION.

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Look for them.

They can be observed traveling from filth to food and introducing the germs they have collected.

CLEAN UP AND KEEP CLEAN

Do not leave food exposed to flies anywhere.

Eradicate all filth.

Flies breed in animal excrement, straw, decaying vegetables, fruits and warm earth soiled with organic matter such as drippings from kitchen wastes and sputum.

RECIPES FOR STABLES AND SOILED EARTH

Powdered borax sprinkled about the garbage platform, spit boxes, stables and corrals is poisonous to flies and not to animals. After the borax is scattered it should be sprinkled with water. Sulphate of iron, chloride of lime or lye dissolved in water in the proportion of one ounce to the quart, if sprinkled in vaults or in spittoons will prevent flies occupying them.

CAMP SURGEON.

Taking advantage of the predilection shown by flies for alighting upon wires, hundreds of sticky wires were fashioned in two foot lengths hooked at the top and made spiral at the bottom. These were dipped in a mixture of resin and castor oil and hung in all kitchens. When well loaded with flies, the wires were cleaned, redipped and rehung in situ.

GEO. L. A. DALE,
Major, Medical Corps, U. S. A.
Camp Sanitary Inspector.

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It Floats

IVORY SOAP floats. It is the original floating soap. This quality gives Ivory Soap distinct advantages.

Ivory Soap always is at hand; one does not have to grope for it nor is it left in the water to waste away.

Ivory Soap always is in sight; there is no danger of injuring oneself by stepping on the cake in the bathtub.

Even if Ivory Soap were no better than other soaps its floating qualities would make it more desirable.

IVORY SOAP IVORY IT FLOATS **99 44/100% PURE**

PROCTER & GAMBLE PRODUCTS · EST. 1837 · CINCINNATI

Factories at Ivorydale, O.; Port Ivory, N. Y.; Kansas City, Kans.; Hamilton, Canada

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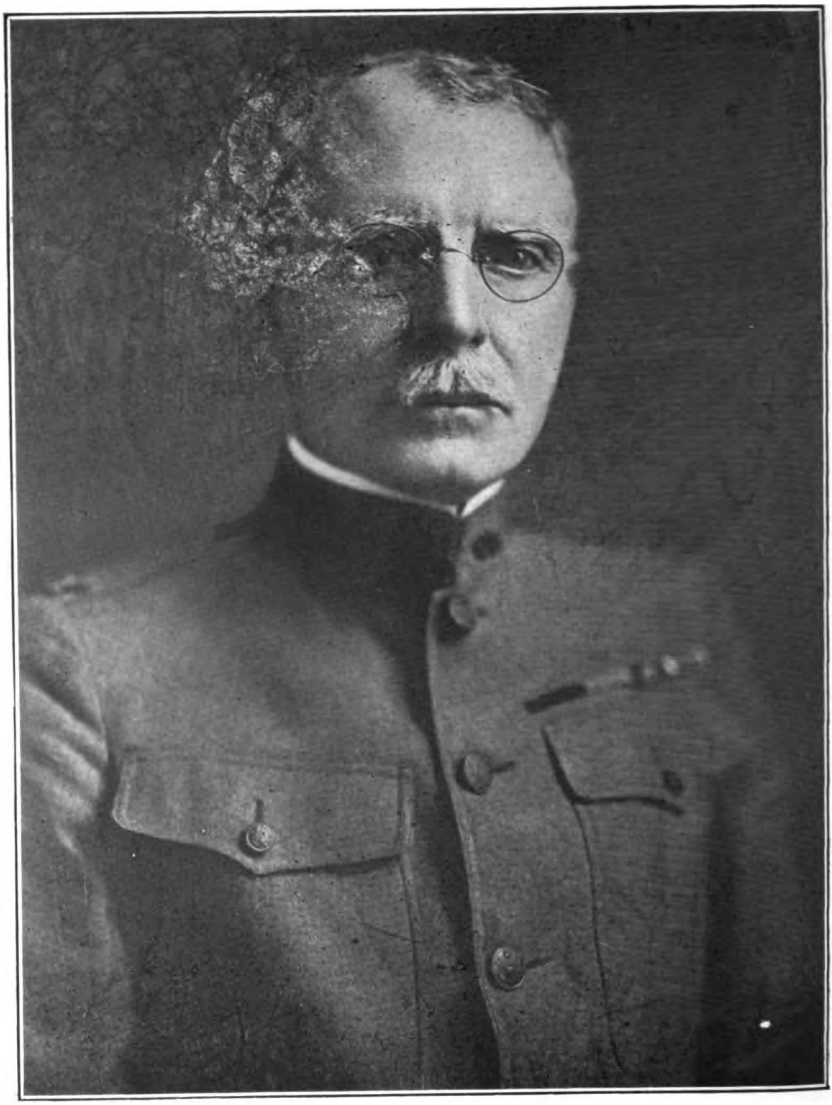

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THE
MILITARY SURGEON

VOL. XLIV NOVEMBER, 1919 NUMBER 5

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE RELATION OF THE CIVIL PRACTITIONER TO THE MEDICAL CORPS OF THE ARMY[1]

THE greatest and by far the bloodiest conflict ever waged between man and man in the history of the world ended on the 11th of November, 1918, when the last shot preceding the armistice was fired at the hour of 11 a. m. on that memorable date.

There was much about it that has shocked and grieved the world at large by the unparalleled and wholly unexpected display of utter savagery and an absolute disregard of all our cherished ideas of the humanities on the part of a practically undivided people, from whom the world on account of their other achievements had a right to expect something approaching the ideals of modern civilization and enlightenment. And the sad part of it is that to meet this savage onset the forces arrayed against it were compelled to fight this modern diablery, in part at least, with its own fire.

But out of the wreck and welter of all this one turns with a sigh of relief and a conviction that all is not unhuman and inhumane to the uplifting and consecrated work of the medical man, and among the many testimonials so freely offered, the feeling of his combatant brother, than whom none other knows so well the full scope of his beneficent and devoted work, the exposition of which was so clearly and so feelingly expressed by the Commander-in-Chief of the American Expeditionary Forces in one of his recently published orders, is, perhaps, the most highly appreciated commendation that has been paid him. Moreover, when the history of this war is written, one of its brightest pages and one about which there can be absolutely no dispute will be the one that relates to the preeminent part in this titanic struggle played by the Medical Departments of our Army and Navy. And this brings me to the subject-matter of my discourse.

In the war, we hope now happily concluded, the Army and Navy

[1]Address delivered by Col. H. P. Birmingham, M.C., U. S. A., retiring president, at the twenty-seventh annual meeting at St. Louis, Mo., October, 1919.

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of the United States have been indebted to the medical profession of this country as never before in history. When the armistice was declared, no less than 34,987 doctors were serving our Army in uniform, as against a slender peace footing of 447 regular medical officers and about 1,600 reservists, most of whom were inactive before the declaration of war. In the Medical Corps of the Navy, about 3,000 physicians were on active duty, as against a peace personnel of 515. The particular things these men have done in helping to win the war are too well known to you all to need further comment. They are fresh in our minds and hearts as one of the big triumphs of the organized medical profession and will soon be a matter of recorded history.

Glancing for a moment at the history of military medicine in the past, we find the same condition everywhere. In nearly all wars of ancient and recent times, the medical departments of armies have usually been in a state of neglect and unpreparedness from the start, and have had to draw their personnel from the civilian profession. There are only two exceptions, ancient Rome and modern Germany. In the Trojan war, Machaon and Podalirius, the sons of Aesculapius, did surgery on the battlefield, along with other warrior chieftains. The Romans, with a well-organized army, in constant activity, had an organized medical service, small in size, it is true, but well in evidence on the Pillar of Trajan and in the plans of such of their military hospitals as have been excavated. In the Middle Ages, the status of the average surgeon was little better than that of a menial, but in the higher ranks of the profession, some of the greatest surgeons in history, such as Saliceto, John of Arderne, Jerome of Brunswick and Gorsdorff, saw field service and have left their records of it. The outstanding example is, of course, the great name of Ambroise Paré, who came to Paris as a raw barber's apprentice, with no social status whatever, and made his way to the front by going into the army. His surgical writings, especially his early book on gunshot wounds, have the military flavor everywhere. In Paré's time there were a great many such books on gunshot wounds, all written by civilian surgeons who saw army service some time in their lives. William Clowes, the greatest English surgeon of the sixteenth century, was in the British Navy and saw fleet service against the Armada in 1588.

In the seventeenth century we first find the army surgeon in a definite uniform, one of the first signs of real medico-military organization. I need only refer to Richard Wiseman and the many German names of this period. In 1761 John Hunter leaves his dissecting room to sail for Belle Isle, writes his treatise on gunshot wounds and becomes Surgeon General of the British Army (1790). In 1742 Pringle is called

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from his chair as "professor of pneumatics and moral philosophy" in Edinburgh to serve with the Earl of Stair on the continent. He takes part in the battle of Dettingen in 1743, where he is instrumental in establishing the earliest phase of a Red Cross Convention, becomes Surgeon General (1742–58) and writes a great book on diseases of the army (1752). Van Swieten in Austria, Richard Brooklesby in England, Morgan, Shippen and Rush in the American Revolution, James Lind in the British Navy, and many French and German names will occur to you. In Germany, Frederick the Great had to send his medical cadets to Paris, the great surgical center of the time, for instruction. The surgeons general of his army all acquired fame in the history of medicine. And so the story goes down to the scramble for civilian personnel in the Crimean War and the enrollment of Weir Mitchell, W. W. Keen, Billings, Hunter McGuire and many others in our own Civil War. Later on, we find that Helmholtz, Laveran, Widal, Cohnheim, Koch, Loeffler, Sir Leonard Rogers, Sir William Osler, Sir Robert Jones, Sir George Makins, Tuffier, in fact the whole medical profession of France and Germany, in the recent war, have done service in the army at some time in their lives; and even un-uniformed civilians, like Virchow, Lord Lister, Da Costa, Stephen Smith, J. J. Chisholm and Raphael Blanchard have turned aside from professional and scientific work to do war-work of greatest value. It is a fact of extraordinary significance to us all that the war service of these men was casual and incidental, yet in each case, we can hardly doubt, rendered in the same cheerful, loyal spirit which has been the common feature of your own service.

May we not draw from these stirring examples some abiding principles for the future? We have, at least, to face this salient fact, that the medical departments of armies in time of peace are usually kept down to a minimum of personnel, and that much of the lost motion which is the inevitable consequence of getting into a war without preparedness is due to this fact. Now the main object of this Association is, and has been, to keep the medical profession of this country in touch with the Medical Departments of our Army and Navy for possible use and service to the country in time of war. After such an experience as we have just gone through, no hard-headed man will again say that wars are unavoidable things, meaning, of course, things people would like to avoid. Have you read Osler's remarks about the transition from the peace-lover, the "proud, mealy-mouthed Victorian," to the actual fighting man, ready to give the enemy a good run for his money?

Dreams and theories do not always work out as per specifications. Wars simply happen as other things in the course of human events—and the main thing is to be prepared for them—in some measure, at least.

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We have, at this meeting, an opportunity which may not come to us again. We have a chance to promote unity and concord where it is sadly needed, and not so much for the individual, selfish good of any one of us or any group of us, as for the good of our common country. Shall we follow the lower or the higher motive? Shall we have a divided hour or a compact, serviceable organization of men interested in the military welfare of the country? All of us, each and every one of us, have had our grievances, and our natural safety-valve is to grumble about them occasionally. There is something suspicious about the man who doesn't grumble after it is all over. It is the catharsis of the emotions which the antique philosopher regarded as the sufficient reason for the tragic drama. You know the old army poem about the "Army Growl":

Oh, beware of the cock that never crows,
Of the bird without a song;
Oh, beware of the duck with never a quack—
There is something radically wrong.

Oh, beware of the dog without a bark,
Of the snake without a hiss,
And beware of the soldier without a growl—
Above *all* remember this."

But I take it—indeed evidence enough is piling up in print and otherwise—that most of the men who have come through this war alive are proud of their service. And here I should like to file a brief for the regular medical officer of the Army. He is human like yourselves. Consider him by and large; do not judge of him by the unfavorable specimens. Let me read to you what was written of him some years ago by one of the gentlest, yet wisest and most progressive of our Surgeons General, Robert Maitland O'Reilly:

But besides his professional work in medicine and surgery, the medical officer of the army has to be master of another subject, of which but little is known to the outside world. This subject is medico-military administration, which deals with complex, difficult, and important problems. It rests upon a professional basis, but it requires a profound knowledge of army regulations, of the life and duty of the soldier, of military and international law, of the relation of the different departments of the army to each other, of the sanitation of large bodies of men in camp and field, of transport of sick and wounded, supplies, establishment, management, and supply of field and base hospitals. It is a specialty and a specialty which requires at least as careful and judicious study as any other. On an exhaustive knowledge of it rest the preservation of the health of the army in the field, the collection of the sick and wounded, their transportation from the field to the base hospitals, with care that through all these steps the minimum of hardship is inflicted and that the operations of the military force are not hampered. It involves an accurate keeping of records, for on this depends the preservation of the rights of the Government as well as those of the soldier. When it is recalled that upon the records of medical

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officers have been based the vast disbursements of the Pension Office—more than three thousand millions of dollars—the importance of these reports can be appreciated.

I desire to recall to you the name of one who was a master of this specialty; who, assuming the position of medical director of the great Army of the Potomac, after twelve years' experience in Indian wars, with no information later than could be gained by a study of the Napoleonic campaigns, organized supplies, ambulance corps, division hospitals, and, in fine, brought order out of chaos, with the result that it was the proud boast of the great army that its sick and wounded received immediate attention; that on the battlefield the wounded were succored in an incredibly short space of time, and that no man suffered for want of medical care and nursing. The specialist to whom I refer was the late Surgeon Jonathan Letterman, whose name is honored by us, as are the names of Larrey and Esmarch. Yet, outside of the army, who has heard of Letterman? His own daughter learned a few years ago from Esmarch for the first time of the greatness of his reputation!

And so, gentlemen, we ask all of you to recognize that the trained military medical officer is a specialist in a most important subject, and we ask you to do your share in informing the public that to be a successful and competent medical officer of the army other qualifications must be added to skill in medicine and surgery.

The war has done much for the medical profession of the country, from top to bottom, for in large measure you have all been in it and of it. It has given the big man, perhaps, a broader, larger view of the scope of his work and of the value of the man below; it has been an inspiration and an incentive to hard, earnest work for the younger and less experienced man and has left him better equipped in every way; it has taught the specialist more clearly, perhaps, than ever before the necessity for close relation and coöperation with his fellows; it has, I believe, deeply impressed all who have entered the service with the disciplinary value of good fellowship and team-work as a general essential to success; and it has taught all the importance, aye, the necessity of sanitary surroundings and hygienic living, as well as the ways to meet them, the value of which, particularly to the rural man, will long be in evidence.

But above all—and I am now speaking as a medico-military man only—it has forged a bond of sympathy and understanding between the profession of the country at large and the Regular Corps of the Army, which establishes us as medical confrères, each laboring in his own line in times of peace, but a united, compact, and efficient serving body for the country in time of war.

I therefore ask you to coöperate with us in the problems of the future, in the military welfare of our country in peace and war. As has just been said, the services we have rendered, and of which you have borne by far the larger part, will make one of the most brilliant pages in our history, and when the final account is rendered, you will find that nowhere have these services been more appreciated and better

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evaluated than by the Medical Department itself. Let us then continue together, in friendship and concord. Let us hold fast to our old watchword, "In union there is strength."

SHORT SKETCH OF THE RETIRING PRESIDENT, COL. H. P. BIRMINGHAM, M.C., U. S. A.

It is a great heritage to a man, in any calling, that he has been able, by honest effort, to merit the universal esteem of his associates in that calling. The acquisition of place, merely as place, is not the *summum bonum* in life, and the intangible wealth which comes to him who merits and gets the love and approval of his coworkers is the real recompense of good deeds.

No man ever finished his active career in the army with a better place in the hearts of his fellow-soldiers then Gen. Henry P. Birmingham of the Medical Corps. No one "wanted his file" when he retired. Born in New York in 1854, General Birmingham's youth was spent in the city of St. Paul. He was graduated in medicine from the University of Michigan in 1876 and began his army career as an acting assistant (contract) surgeon on November 2, 1878. He went at once into that school of hardihood which the Army maintained in the adjustment of conditions on the frontier, and his first service was performed under Generals Hazen and Ruger in the Sioux Indian country. He was appointed a first lieutenant and assistant surgeon in the Regular Army on February 18, 1881, and continued on duty in Colorado, Utah, Arizona and New Mexico until the latter part of 1885, under Generals Cook and McKenzie. During this service he was complimented in orders for his coöperative spirit and for gallantry in action against hostile Apache Indians.

The outbreak of the Spanish War found him again on duty in the west, whither he had returned after a short time in the east. He was at once assigned to duty with the First Division, First Corps, at Camp Thomas, Chickamauga Park, and went to Porto Rico with that organization in July, 1898. Arriving in Porto Rico he was given the assemblage and organization of U. S. General Hospital No. 1 at Ponce, and so well was this work accomplished under conditions of great adversity that he received the recommendation of his commanding general that he be given a brevet commission.

In 1899 General Birmingham went to duty in the Philippines, filling various positions of responsibility in command of hospitals as chief surgeon of expeditions, etc., until his return to the United States in 1902.

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During the next four years he served on important duties on Chief Surgeon of Maneuver Camps, on medical examining boards, and as Chief Surgeon of the Department of Texas.

The years between 1906 and 1909 he spent in Cuba as Chief Sanitary Inspector and Chief Surgeon of the Army of Cuban Pacification. This work in Cuba was signally successful, and after two years spent in Washington as President of the Army Medical Examining Board he was ordered to duty as chief surgeon of the division mobilized at San Antonio, Texas, in 1911. It was in the camp of this division that the world was given the first conclusive demonstration that enteric fever could be entirely eliminated as a disease inevitable to aggregations of soldiers under mobilization.

It was quite consonant with the estimation of General Birmingham held in the War Department that he should have been ordered to Mexico with the Vera Cruz expedition, as chief surgeon with General Funston in 1914. He remained on that duty until November, 1914, when he became Chief Surgeon of the Eastern Department.

In May, 1916, he came to Washington and was acting surgeon general for six months, during the concentration of troops on the Mexican border.

In 1917 he was sent to France on an inspection trip and while there was promoted brigadier general in the National Army. In March, 1918, he was retired from active service as a colonel, being then 64 years old.

No survey of General Birmingham's service can convey with entire exactness the full scope of the estimation placed upon him by his fellow army officers. That could only come in full measure from contact with him. The older the man passing the judgment the more full the meed of praise, just because he knows the better what broad entitlements General Birmingham has really earned.

Whether it be the rough riding cavalryman of the days when saddle pockets were made to carry one's reserve wardrobe, or the young medical officer looking to be taught how to do it by the "Old Man," the heart beat the quicker when he came around, and the glow of affection and friendship became the more effulgent in his presence.

General Birmingham's career epitomizes his character and his aptitudes. His has been the lot of an active man, plying his trade with energy and skill and always to the point when things were to do. How well he did them is so known to those who know him that he must get a great recompense in the consciousness that his fellows think he has deserved well of his country.

Taking his place among the ex-presidents of this Association he joins a group of distinguished men, and he goes into it with the great, good wishes of all who know him, and therefore esteem and love him.

F. A. WINTER.

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LOGISTICS OF THE MEDICAL DEPARTMENT OF THE NAVY FOR DISTANT OPERATIONS OF THE FLEET

By Captain FRANK E. McCULLOUGH
Medical Corps, United States Navy

NEITHER ancient nor modern naval history records any preparation, extensive or otherwise, for the evacuation of the wounded after a battle, for the engaged ships, except to another fighting ship until after these ships had arrived in port. The evolution of maritime warfare was necessarily slow, and the development of accessory and auxiliary vessels for any purpose was practically coeval with the development of the marine engine. The development of modern surgery was even later, while the practical application of emergency surgery to naval warfare is still in its infancy. Naval engagements on an extensive scale in recent history have been relatively infrequent until the occurrence of the present war. Lastly, the invention of high explosives and large calibered rapid-firing guns, with all the destructive effects upon the human body and the incident high mortality, has stimulated interest in the saving of as many as possible and the bringing to bear of every element to produce this result. In our plans for national preparedness there is nothing deserving of more painstaking consideration than the logistic features of the Naval Medical Department of a sea campaign or a great naval battle. Vessels of war and practically all the components of the train—the supply ship, the repair ship, the collier, etc.—are requisites for peace time as well as during the existence of war. The hospital ship and medical transport are practically the only vessels of the Medical Department entering into the logistics of naval warfare that were part of the peace program. Medical transports must be relied upon to remove the bulk of the wounded from fighting ships to a sanitary base.

Our conceptions of the logistic problems in our naval medical department, like many other features of naval warfare, have undergone considerable modification as the result of naval engagements in the present European war, and also from the lessons learned as the result of "war games" played at the Naval War College and by the Atlantic fleet.

The enemy submarine operations against hospital ships, in violation of international agreement, do not change the situation—they merely complicate it. It may be reasonably assumed that the repeated violation by the enemy of the agreements of the Geneva and Hague Conven-

[1] Read at Annual Meeting of The Association, held in St. Louis, Mo., October 13–15, 1919.

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tions have produced a situation which amounts to the non-existence of these agreements, as the outcome of contractual violation. In spite of German "schrecklicheit," it is safe to assume that our attitude toward the enemy will be guarded by the humanitarian spirit of the law of nations rather than the technical interpretation of international law.

It is only necessary to consider the immense coast line of our territory on the Atlantic and Pacific coasts and the remoteness of our insular possessions in the Pacific to begin the realization of the tremendous logistic problems confronting the Medical Department of the Navy. On the Atlantic, the scouting area may include from the coast of Newfoundland to well below the southern end of Florida. The possibility of an enemy seizing an advance base in the West Indies, or equipping one possessed by it, would require a scouting line well advanced to eastward. The necessity of defending the Panama Canal gives a still further scouting area. The Pacific coast, if anything, furnishes a more difficult logistic problem. While it may be safely assumed that our country has no hostile designs against any of its Pacific neighbors operations against this coast must be considered in our problem. It is axiomatic that any nation holding over-sea territory must be prepared to defend it or accept its abandonment to a captor. If such territory be occupied by an enemy, the enemy must be ejected, or an enormous loss of national prestige would ensue, and this, in itself, might be sufficient to invite further aggression. Different viewpoints of policy may arise. A nation may declare its intention to relieve the engorgement of her pent-up lands by the insistence of her right to permit her surplus population to emigrate to other lands not within her jurisdiction. Being met by the assertion that it is a principle of international law that each nation has the right to exclude the people from all other nations from its shores, an invasion of the Pacific coast, either diretly, or via Guam and Honolulu, or both, should be considered as not improbable and the logistic possibilities considered.

Let us examine the text of the "Manual for the Medical Department, United States Navy" for its plan for the transportation of the wounded after a naval battle.

Article 1822 (*a*) reads: "Modern naval warfare presupposes a high casualty rate and a rapid accumulation of wounded, but the casualty rate will vary widely in different ships, probably being highest in the leading divisions. Any effective organization of the Medical Department will usually go beyond the facilities of a single ship and will necessitate the adoption of a more comprehensive scheme of assistance external to the ship, but every vessel should be self-sustaining as far as possible, and no effort should be spared to attain this end."

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Article 1832: "When the medical transport or hospital ship is at hand the seriously wounded should be transferred as quickly as is consistent with their welfare. A fighting ship should be cleared of such cases as soon as possible after an action, in order that she may be ready to reengage in battle. On the other hand, patients who will probably soon be fit for duty should be retained on board, and these may constitute a large proportion of all cases."

The plan devised by Medical Director C. F. Stokes, U. S. N., for transporting the wounded after a battle from the engaged ships to the sanitary base is worthy of consideration. It provided for a medical transport (which should be from 10,000 to 20,000 tons) capable of conveying 1,000 wounded, and with a personnel of 75 medical officers and 300 members of the Hospital Corps for each division of four battleships and its auxiliaries. The medical and hospital corps personnel on each transport will be divided into four divisions, one division to be assigned to each battleship and one to the auxilaries. The personnel "would be familiarized with the equipment, drilled in boat work and instructed in the structural peculiarities" of the vessel or vessels to which they would be assigned and also "would be required to make preparation of the spaces assigned on board the medical transport. After action, or during the interval when not engaged, the medical transport units would be placed on their respective battleships with their specially prepared equipment of dressings, etc., and take charge of the wounded for removal to the medical transports. The transports would visit each ship in turn. The flow of wounded would thus be continuous and the fighting ships expeditiously cleared."

The proposed transports were to be liberally provided with boats for conveying the wounded, which are also to be used for saving the shipwrcked. All medical transports are to be available at convenient rendezvous when battle is anticipated and will repair to the scene of the battle at maximum speed when so directed by radio, and "make ready the boats for transportation and rescue. If local conditions permit, the medical units will be rapidly transferred to the fighting ships. Under certain conditions it would be inadvisable to transfer the wounded to the medical transports, but to carry them to the sanitary base in the fighting ships, the medical units remaining with the wounded."

This organization at least presents a logical plan of assignment of definite transports to definite groups of ships, and, as it is necessary to approach any military subject with a definite conception of concrete organization, it has the merit of bringing an otherwise haphazard situation out of chaos. Even if its every detail were found to be impracticable, a complete understanding of the principles it involves would

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permit a practiced personnel, provided with adequate equipment, to estimate more intellligently any situation which might arise, and to form a decision leading to effective action.

The majority of writers who have approached this subject have assumed that they are operating always with a victorious fleet. Also the assumption that the transport will keep near the division is not considered tenable. The various tactics which may be employed (for example, those of battle cruisers participating with the main body) will necessitate the disposition of the transports to a position anything but near their divisions. During the progress of a battle, the material injury to a vessel may so reduce its speed as to force its retirement from the position prescribed for it in the battle plan. A whole division may be sunk, and other accident or accidents may cause a wide dispersion of many of the fleet units. A division of battle cruisers may be hundreds of miles distant from one another when one or more battle cruisers may be compelled to engage a superior force. Scouts and destroyers may find themselves, on the sudden clearing of a fog or mist, to be under the fire of a battleship, and, in spite of their superior speed, may be sunk before they can escape. The losses inflicted by the night destroyer attacks give but slight chance for the salvage of lives.

It is not well to be too idealistic in the solution of these problems. Such accidents as the falling out of position of a vessel may easily be coped with after the battle (if we are the victors), and, under certain conditions, a fast transport may be signalled by radio and rescue the crew of a sinking vessel even before the conclusion of a battle.

Though it is neither stimulating nor salutory to consider defeat, it is still very necessary. Our geographic position is widely different from the countries of Europe now engaged in this warfare. Our sea battles may either be fought off our own or the European coast or 1,000 miles distant, which means that our possible logistic problems are much vaster than those of the North Sea engagements.

It is well to consider the possibilities of operating with a defeated fleet. The mission of the medical transports is not changed by defeat; their mission continues to be the evacuation of the wounded from ships that have been in battle, their removal to a sanitary base, and the rescue of the shipwrecked.

Operating with a defeated fleet means an entirely different status for the wounded and those rescued from shipwreck. The enemy commander-in-chief may adopt any of the courses vested in him by the authority of the Hague Convention of October 18, 1907, for the Adoption of the Principles of the Geneva Convention of July 6, 1906, to Maritime Warfare (Article 14), to which the United States was a

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signatory power, viz.: The shipwrecked wounded or sick of one of the belligerents who fall into the power of the other belligerent are prisoners of war. The captor must decide, according to circumstances, whether to keep them, send them to a port of his own country, to a neutral port or to an enemy port. In the first case, prisoners, thus repatriated, cannot serve again while the war lasts.

While the personnel is thus affected, the hospital ship or medical transport comes within the provisions of Article 1 of the same convention, which prescribes that they "cannot be captured while hostilities last." A medical transport comes within the same classification as a hospital ship according to the definition of Article 1, to wit: "Military hospital ships, that is to say, ships constructed or designed by states specially and *solely* with a view to assisting the wounded, sick and shipwrecked, the names of which have been communicated to the belligerent powers at the commencement or during the course of hostilities and in any case, before they are employed shall be respected, and cannot be captured while hostilities last." It is to be carefully noted, however that a ship employed for the transportation of the wounded and also for other purposes, as supplies other than medical, would not come within this exempted classification.

Our operations with the allied fleets merely transfer the problem overseas to the European mainland and the British Isles. The Navy considers its equipped establishments ready to care for any naval battle which may occur.

It is not believed that it would be necessary to establish large hospitals at any of our possible advanced bases in the Atlantic. The nearness of the mainland to any such point would seem to render them unnecessary. The hospital ships of the regular establishments could be relied upon to care for the severest cases of injury or sickness more efficiently and probably more economically than such hospitals. The distant Pacific, presenting a very long oversea voyage, renders the reverse course seemingly advisable, and the establishment of advance base hospitals at both Guam and Honolulu appears to be the expedient measure.

The main sanitary bases, both on the Atlantic and Pacific, have been provided for and would be quickly utilized after a battle.

As modern naval strategy demands that the major portion of a fleet remain concentrated for battle, no great difficulty will probably be experienced in conveying the necessary information to the medical transports which will permit them to be at the most favorable situation possible for the performance of their functions after an engagement. Raiding operations may be at such great distances from the hospital ships or medical transports that relief may be long delayed.

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Apart from the enemy violation of Hague Convention agreements, the question of furnishing a defensive escort for medical transports and hospital ships must be considered, especially in the case of a battle which is not distinctively decisive, as both transports and hospital ships are subject to capture and the wounded and shipwrecked made prisoners of war.

The speed of our medical transports should be equal to that of the battleships, when possible; the need for keeping up with the main body makes this self-evident.

As Commander E. M. Blackwell, M. C., U. S. N., has pointed out, transferring the wounded from the warship to the medical transport after the battle will be the most difficult problem that confronts us in transporting them to the sanitary base. In smooth water this could easily be effected; but this condition not often prevails in the open sea, as there is generally a swell or waves that interfere and make the process of transference very difficult for the hospital corps and dangerous for the wounded. This will be rendered more difficult from the fact that the cranes and davits on the warships will generally be shot away or otherwise placed out of commission, and it will be necessary to improvise means of lowering patients over the sides into boats or transferring them by trolley direct to the transport. When the sea is only moderately rough, it will be very difficult to transfer patients by means of boats. When practicable and convenient, it would be best for the ships of a division to make for some quiet waters after the medical divisions of the transport arrive aboard and are rendering first aid, etc., en route, and then transfer the wounded to the transport upon arrival there. This would serve the double purpose of giving a quiet place for repairing the damage done to the ships as well as transferring the wounded.

The manifest difficulties attendant upon this operation make it worthy of much experiment and practice as there are many occasions on the broad ocean when the sea will not be sufficiently smooth to permit the transport to go alongside the battleship.

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THE MILITARY ASPECT OF BASE HOSPITALS[1]

By Lieut. Colonel GUSTAVUS M. BLECH
Medical Corps, United States Army

IT HAS been recognized long since that if our frontal sanitary formations are to function satisfactorily, they must be organized and maintained on a strictly military basis.

There may be a diversity of opinion about the professional limitations at dressing stations and field hospitals and, to a certain extent at least, also of our evacuation hospitals, but there can be no disagreement on the proposition that these units are part and parcel of the large combatant units which they serve, and that they must adapt themselves to the strategic or rather tactical situations confronted by the divisions, corps, army groups, etc. These conditions necessitate that medical officers serving with divisional and corps sanitary formations must be as conversant with things military as their comrades of the line.

Indeed, there should be little difference between the military training of either class of officers except that each should master his respective specialty. In all general subjects, such as map reading, marching, camping, familiarity with field service regulations and the like, all should possess the same amount of knowledge.

I believe that these views can be looked upon as axiomatic. But when it comes to the medical service of the rear we encounter not only among the civilian profession but among many medical officers as well views which seem entirely out of place in a modern army.

The idea seems to prevail that base hospitals require the members of the staff to be skillful only in their particular professional specialties and that, if they know enough to wear the prescribed uniform, return salutes and sign the monthly pay voucher, they know all there is to be known for them about the military side of their service.

It will be worth while to examine with reference to base hospitals the following hypothesis:

The medical service of the Army is part of the Army the same as the line troops and other technical corps and, like all other services, its sole right to existence in the military family is its contribution to the achievement of a decisive victory over an enemy.

The medical service has been described as the non-combatant branch of the Army, a term, by the way, which is as unjust as it is obsolete, and the question naturally arises in what manner it contributes to battle victories.

The answer is simple. A battle undertaken without the presence

[1] Read at the Annual Meeting of The Association held in St. Louis,, Mo. October 13–15, 1919.

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of an organized medical service is doomed in advance. If the medical service were to do no more than morally sustain the men on the firing line through the knowledge that, in the event of casualty, skilled aid awaits them, the service would have its *raison d'être*. But the service does more than that. We must recollect that armies are fixed in number. A nation can furnish a limited number of men for field service, and once that number is exhausted and the issue undecided the nation is practically lost. It is the province of the medical service to reduce casualties from other than battle wounds to a negligible minimum. Selection and public, or, more correctly speaking, military hygiene attain that end. But battle causalties proper, even under the very best strategic leadership, are bound to occur, and upon the medical service lies the responsibility of preventing the firing line from becoming depleted for too prolonged a period. If this be accepted as the proper means of usefulness, it follows that the entire medical service at the front must relieve the combatants from all care of the wounded, must provide such aid as will insure the speediest possible restoration of the greatest possible number of effectives, temporarily placed *hors de combat*. Naturally this will be possible with the so-called slightly wounded, because they still represent a military asset; but the gravely ill, those who are out of the fight forever, and even those who cannot be cured for a prolonged period, cease to be a military asset and naturally are sent to the rear.

Now comes the surgeon serving in base hospitals and says: "You at the front are really soldiers specializing in transportation and first aid to the slightly wounded. You cannot practice surgery at the front, for the wholesale character of your work compels you to be content with a classification of the wounded and the rather pattern-like care of those which require no special scientific treatment. In other words the humanitarian aspect of your calling has to yield to military necessity, but in my place each wounded man is no longer a soldier but an injured individual, and I shall afford him the most scientific care since I have the time, equipment and necessary leisure."

Such a view is partially right and partially wrong, and, if allowed to predominate, will serve to detract from the usefulness of base hospitals

The fact is that the above hypothesis applies to the entire medical service; to all individuals from the Surgeon General of the Army to the soldier packing up requisitions. From the regimental surgeon arresting hemorrhage and applying splints to the specialist in the rear suturing a torn nerve or mobilizing an anchylosed joint, and whether mobile field hospital in shacks or base hospital in a royal palace, all have the same purpose and the same *raison de'être*.

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The last war has shown that a modern campaign of importance can be divided into three distinct periods. The first embraces mobilization to the arrival in battle position, the second lasts from the first battle to the institution of peace preliminaries, and the last sees the beginning and end of demobilization.

Up to the last period base hospitals, like all other sanitary formations, have the sacred duty of reducing the hospitalization days of each individual soldier to the minimum. This practice has not been much in evidence in the hospitals I have had occasion to observe in France. I found a tendency to criticize the colleagues of the front, as though they could be blamed for infections, and a policy of holding the patients as long as possible. Ask the individual soldiers and you will hear nothing but praise for their base hospital surgeons. And why not? The wounded who have missed regular meals and beds at the front have these things now and, in addition, the companionship of female compatriots, though it be only for moments in the ward, and they are willing *particeps criminis* in remaining inmates *ad infinitum*.

The front is miles and miles away. The men are detached from their units, dropped from their rolls. They are now carried on the rosters of the hospital, even drawing their pay there, so all is beautiful and serene. All, except that the base hospital unwittingly is harming the Army it is supposed to serve!

The trouble is that in the Manual of the Medical Department of our Army the entire subject of the function of base hospitals is dismissed with a few vague phrases. Straub and that eminent medical strategist, Munson, do not touch it at all, with the result that base hospital personnel have had little to guide them in their military duties before accepting service.

It will be held that there is no need for all this since every competent surgeon is anxious to cure his patients *tuto, cito et jucunde*, but in large institutions the *cito* undergoes varying definitions, depending on a variety of circumstances, but principally due to the lack of insight by responsible surgeons as regards the proper rôle base hospitals play in the Army.

In the first place there is a difference between base hospitals and base hospitals. One institution of this title and designation may be so close to the front as to serve as a natural drain for the evacuation hospitals of the concerned area, while others may be no more than overflow hospitals or, perchance, demobilization hospitals. The surgeons in either must know that they, like their comrades in the frontal formations, have only one mission in the Army, and that mission does not differ one whit from that prescribed for, let us say, field hos-

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pital personnel, except with regard to the character of the professional work.

An army is not a permanent organization even under the most ideal conditions, therefore each base hospital surgeon has to determine in each case whether there is to be a likelihood of a complete cure within a reasonable period, whether there is to be a partial cure so that the Government can still utilize the services of the concerned individual, or whether the case is entirely lost to the military service. With this in view there is certainly need of strict organization, of rational classification of the patients and the determination of treatment adapted to the diverse military situations.

It is evident from what has been said that even the professional policy of the various sanitary formations must be governed by military needs. This is fully understood by permanent army officers but, unfortunately, is a subject little appreciated by many who before the war were active in the organization of base hospitals under the Red Cross for future service with the Army. The distinguished medical men who gave up much time and labor in the perfection of their staffs anticipated that they would be free to devote all their time to professional work, and looked upon the prospective appointment of military men as mere adjuncts for the purpose of military administration. This was my experience, and if here and there an exception could be noted, that exception merely proved the rule.

Let us glance at the administrative side of a base hospital. I begin with the commanding officer.

The right kind of a commanding officer will usually be a medical officer who has not only thorough knowledge of things military in general but one who is also thoroughly grounded in medicine and surgery. It is he who is responsible for the discipline of his institution, and that means that all patients are promptly classified upon arrival, properly treated while in the institution, and evacuated forward or rearward, as the case may be, at the earliest practicable moment. Such a commanding officer is not a mere fifth wheel to the wagon nor a mere administrative figurehead to authenticate reports and statistics and to direct the adjutant to read the incoming general orders at the officers' meetings, but is a man who can supervise the activities of the chiefs of the various services in an intelligent manner.

I, for one, am directly opposed to utilizing outsiders for administrative work of medical organizations and institutions. I concede that a quartermaster should be drawn from the Quartermaster Corps. I am satisfied that an infantry detachment should be entrusted with guard duty. I am further willing to have the medical supply problems handled

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by a specially qualified officer of the Sanitary Corps, but all other functions should be in the hands of medical officers.

In France the majority of adjutants were sanitary corps officers, and in my own hospital such an officer proved more reliable than a medical officer who held that office for several months, but that one experience has served but to emphasize my opinion that in large hospitals a well-trained medical man must make a real adjutant, whereas a non-medical officer will be no more and no less than a higher sort of clerk. The fact is that the function of an adjutant is to be the intermediary between the commanding officer and the diverse departments, and only a medical man, in accord with the ideas and professional policies of his commander, can be a real adjutant.

Next in importance is the registrar. I have seen some well-educated men acting as registrars who have never seen the inside of a medical school and get away with the job by means of their cleverness and a good medical dictionary, but I have also seen enough of their work to know that it takes a well-educated physician to be a registrar. One example will suffice. A registrar who knew the entire medical dictionary by heart became all excited because a medical officer did not adhere to the manual in reporting a case of acute appendicitis as catarrhal or suppurative. The officer told him: "How in hell can I tell when the fellow refused to be operated on?"

The same luminary permitted the following classification to go through: "Other diseases of the ear." Well, there it was in black and white in the manual, and that sanctified everything, no matter what the authors of the manual may have had in view.

In each hospital with a large contingent of enlisted personnel one or two officers are assigned as detachment commanders. These officers must be not only good disciplinarians but familiar with the drill regulations as well.

One medical officer as a rule is appointed as summary court, but five additional officers will occasionally be called upon to sit as a special court-martial. What I have seen accomplished in the way of illegalities by medical officers about two years after the first mobilization for the world war would seem incredible. I told one otherwise very able and enthusiastic medical officers who acted as judge advocate that he and his court were just too lazy to look up the manual. Had not demobilization stared us in the face, practice in court-martial precedure would have been added to the curriculum of the officers' school which I felt compelled to institute to get anything like military function out of fifty-five medical officers.

Sanitation is another duty requiring military training. To this

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must be added the detail of medical officers to survey property, to determine the sanity of officers and men accused of crime or military offenses. But one of the most important military features seldom seen in base hospitals is the military aspect of the ward surgeon. The ward surgeon bears the same relation to the patients in his ward that a captain does to his company. A good ward surgeon has order, system and dicipline in his ward. He knows the needs of his wards, their personnel, and is prepared to report in a few moments whatever information is desired from the headquarters.

At the latter office the system may be ever so good, but it will fail utterly with a negligent ward surgeon in the chain. I have seen the spectacle of a soldier being reported A. W. O. L. when in reality he was transferred to another ward without a report. I have seen patients lie on their beds with dirty shoes on, gambling, spitting on the floor, shouting and what not, while the ward surgeon was busily engaged in the diet kitchen with a purely personal piece of business. I have seen hospitals after the armistice without a post flag, without the usual calls, although there was an abundance of matériel and several trumpeters available. I have seen medical officers walk about the grounds a few paces from where the buglers sounded to the color at the inspiring ceremony of retreat in another hospital—in short I have seen enough to wonder why these medical officers did not ever ask themselves why the Government persisted in giving medical officers rank and emoluments when they apparently thought the uniform a mere external to their continuation of practice with the only difference that whereas formerly the patients were civilians paying them, now they were soldiers and their stay in the hospital paid for by the Government.

I have only one comment to make in conclusion—the next time we will know better!

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EPIDERMOPHYTON INFECTION

By Colonel JAMES L. REVANS

Medical Corps, United States Army

PROBABLY many cases of epidermophyton infection of the skin are unrecognized in the Army as in civil life. A recent case, with a significant history, led to consultation with Dr. Charles J. White of Boston, Edward Wigglesworth Professor of Dermatology in Harvard University. His interesting paper read before the American Dermatological Association at Atlantic City in June, 1919, brought out many new facts and emphasized the importance of the infection.

The case was that of a soldier stationed on the Mexican border during the summer of 1916. At that time he noticed an increasing bromidrosis of the feet, made much worse on one occasion when he was required to stand for a number of hours on a hot asphalt pavement. His condition brought him at this time to sick report. His memory of the state of his feet, besides the bromidrosis, concerns especially his left foot, which was "scalded." He remembers blisters between his toes which, on bursting, left the interdigital spaces red. There were tender calluses on the sole. There was a ring of pustules on the inner aspect of the arch. The ends of the toes were red and tender. Burning and itching were marked. Bathing and powdering bettered the condition, as did the application of various washes. Finally a dilute solution of formaline was prescribed, and this helped so much that the soldier "made it stronger." One application of this "stronger" solution, after burning for a little time, brought complete and immediate relief. Desquamation of the skin ensued, and when it was finished he regarded his recovery as established.

During the summer of 1917 the soldier was stationed in two camps. In the first, which was in the south, he was able to control the returning condition by frequent bathing, changing his socks and the use of powder. The condition disappeared on his transfer to the north, but when the very hot weather of late summer appeared he had another struggle, which only ceased during his trip to France in the fall of 1917.

On arrival in France he was subjected to cold and wet. His snug-fitting shoes were made tighter by heavy socks. In case of exercise his feet perspired; in the absence of it they became cold. Bathing was not often practicable. At night his feet burned. Certain toes became swollen; this added to the lack of interdigital ventilation and increased the soddenness between the toes. There were color changes and changes in sensation. In November he applied for treatment. Ortho-

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pedists examined him. The diagnosis was mild trench foot. By this time both of his feet were swollen and sore, but the left was the worse. On this foot the toes were livid, the third and fourth toes being much swollen and purple. There were mottled spots along the ball of the foot and the ends of the toes. Interdigital maceration was noted. The soldier did not give the history of his case. Indeed he did not connect his present symptoms with the past ones, and perhaps there was no connection.

The orthopedic consultants fitted him with good shoes, advised him as to posture, prescribed certain exercises for weak feet, and told him of the value of cleanliness and dry socks and rubbing the feet. He seems to have noted particularly the necessity for dry socks and keeping the interdigital spaces both clean and dry. He followed the directions and came through the winter without having to go to hospitals. There were variations in his condition. In the trenches, where he went later, chilblains appeared, but he escaped the gangrenous spots of the bad cases.

During the spring of 1918 he was almost well, but neglect of his feet for a few days would bring about redness and itching, particularly about the third and fourth toes of the left foot and in the space between them. Once he stood all day in a trench containing thin yellow mud. At night he bathed, but found he could not rid himself of the stain between the toes, and this fact led to the discovery that on the lateral aspect of each toe there was dead skin. So desquamation was continuing at that time.

When the summer of 1918 came to the period of light socks the soldier's feet became nearly normal, but he realized that constant care as to bathing and the changing of footwear was necessary. In July he first noted a spot of typical ringworm, as it occurs on flat surfaces, on the calf of the left leg, just below and to the inside of the popliteal space. This was spasmodically treated with sulphur ointment and has recurred again and again until the present time.

After the armistice he passed a comfortable winter in Germany, with warmth and bathing facilities and plenty of clean clothing. But even here redness around the nails, occasional itching and tenderness and interdigital desquamation continued.

On his return to the United States he arrived during a hot spell. Industrious bathing and changing of socks and the lavish use of powder did not prevent the itching, which was most marked in his left foot. In June, 1919, he noticed a wreath of red spots on the dorsum of his left foot. The third digital interspace was red and glazed. All of the other interspaces of the left foot were sodden. There was a fissure

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under the fifth toe. His third and fourth toes were swollen and very tender. He became aware of itching at the gluteal folds, on the scrotum, and in the perineum. Toward the end of June, nearly frantic with the itching, he applied cold cream to his thighs and foot, and this application, while it brought temporary relief to the itching, was followed by a rapid spreading of the affection.

The case came under my observation, with Dr. White as consultant, on July 5, 1919. At that time the process involved all of the toes and interdigital spaces and was extending up the dorsum and sole of the left foot. On the dorsum was a clearly defined, serpiginous border of petechial spots extending from the nail of the great toe, near the interdigital space, to the dorsum of the foot about an inch behind the other toes and ending on the outer side of the little toe. Inside of the border there were the fine scales of desquamation, lines of pink showing through, the area becoming an angry red at the beginning of the interdigital spaces. On the sole of the foot nearly an inch behind the toes was a somewhat swollen ridge ending in a line of small vesicles. The first interspace was dry and desquamating; the second was pink, glazed and clean; the third was red and glazed; the fourth was moist, white and sodden with small vesicles on the little-toe side, anteriorly and posteriorly. The great and little toes had fissures at the flexor folds. The third and fourth toes were swollen and livid, the nails being somewhat embedded.

The raphé of the perineum, from near the anal border and on to the scrotum for a short distance, was dusky brown in the middle line and a livid red along the sides. There were discrete, superficial red areas on the scrotum posteriorly. The thighs for several inches below the gluteal folds were slightly red. On the right side at the gluteal fold there was a slightly raised, bright red crescentic area, without distinct edges, 3 or 4 inches in extent. The right foot appeared normal. On the hands nothing was seen except for one superficial spot of desquamation, such as is often noticed after slight sunburn, near the third right interdigital space. The faint brownish stain of the quiescent ringworm on the left calf could be seen.

Whitfield's ointment was applied to the foot twice a day, beginning July 5. By the night of the 6th all itching had disappeared. There was much less redness and swelling of the toes. A pustule appeared at the serpiginous border on the great toe. The area on the dorsum was much paler. Desquamation was very active and nearly completed between all the toes. By July 9 the foot was quiescent, the only manifestation being desquamation. On August 5 the foot was normal, except that the fourth and fifth toes had slightly heightened color.

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The interspaces were white and clean. The area on the dorsum had become pink on one or two occasions. The ointment was applied twice daily until the itching ceased, then daily for a week, and after that every two or three days.

As an experimental treatment, alcohol, containing 2 per cent of salicylic acid, was applied twice a day to the thighs, beginning July 5. Itching was temporarily relieved at once. On July 6 all of the lesions on the thighs were much irritated, and the itching was violent. On July 7 Whitfield's ointment was substituted, and by July 9 the left thigh was nearly normal and only the severe patch on the right side remained. That possessed a clear line of demarcation. On August 1 no signs remained.

The right hand on July 8 manifested very slight evanescent desquamation on the palmar aspect of the hand and fingers. It disappeared in a day. Sago-grain vesiculation was felt on the fingers of both hands on July 10, and there was much itching. Desquamation, without apparent preliminary vesiculation, appeared at the webs of the fingers at about the same time. There was itching of the palms, of the fingers and, anteriorly, of the wrists. There was slight increased redness of the natural lines in the palms of the hands. Whitfield's ointment was begun July 10 with a resulting cessation of itching. Desquamation began where the vesicles had been and spread over the entire surface. Treatment was continued, and on August 5 desquamation was completed. There has been no recurrence.

The development of the infection of the right foot was observed from the first. On July 15 a large vesicle was found in the fourth interspace. It contained clear fluid and, when opened, revealed underneath a slightly reddened surface. The ointment was applied at once, and the interdigital space became normal within a few days. A fissure occurred back of the same toe, but healed rapidly. On July 25 a fissure appeared anteriorly in the first interspace. Rapid healing with desquamation followed application of the ointment in this space.

Another interesting little point in the case is that the patient had a large subungual hyperkeratosis of the right third toe. He says it appeared during the summer of 1916. It has disappeared during the month of treatment.

All signs and symptoms had disappeared in the case recorded by August 15. Whitfield's ointment is Acid salicylic, 2; Acid benzoic, 4; Adipis benzoat, 30. It must be cautiously applied because of its tendency to bring about dermatitis. If this condition ensues, a soothing lotion or ointment may be substituted for a time. No complication was observed in the present case.

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In the Journal of the American Medical Association, September 2, 1916, Drs. Oliver O. Ormsby and James Herbert Mitchell, of Chicago, published an excellent article on "Ringworm of Hands and Feet." They describe many cases of what has usually been called dyshidrosis or eczema of the vesicular or vesico, pustular or intertriginous type.

Their review of the literature goes back to 1870, in which year Tilbury Fox first described a trichophyton infection of the soles and palms. He was fortunate in that his first observation was of a typical ringworm on the dorsal surface, and this he followed to its subsequent intertriginous form. Pelligari reported seven cases of involvement of the hands and feet among 150 cases of ringworm of the head. Djelaleddin-Moukhtar, they state, described mycelial threads in 44 cases. Whitfield found 5 cases not distinguishable from vesico-bullous eczema, in 1910, and reported 7 additional cases a year later. Sabourand, in 1910, found the epidermophyton inguinale in 4 out of 6 cases. Kaufmann-Wolff made a mycological study in 1914 of 25 cases which would formerly have been called dyshidrosis. Montgomery and Culver reported a foot case in 1914 which had followed eczema marginatum and in which the epidermophyton inguinale was identified. Hartzell reported 4 cases in 1915, followed in 1916 with 2 cases, one on the plantar surface of the foot and the other of the nails and both aspects of the fingers.

Kaufmann-Wolff's classification is given as follows by Ormsby and Mitchell:

1. *Vesicular:* grouped; marked itching, sago-grains; occurs in hot weather.

2. *Squamous:* resembles scaling dyshidrosis; has central primary lesion; results from confluence of vesicles.

3. *Pyodermic:* secondary infection.

Ormsby and Mitchell give the essential lesion as a vesicle. It is deep seated, of the sago-grain variety, often with clear content. There is no erythema around the new vesicle. A brownish macule follows its bursting. It may remain discrete, desquamate, and produce a slight scaling. It may produce a yellow-brown keratotic button instead of desquamating, thus forming the hyperkeratosis, or it may become bullous. If irritated or infected, the patch becomes eczematoid dermatitis or results in pyodermia. Location changes the character of the manifestation; thus on the hand one sees the exfoliated isolated vesicle and on the heel the hyperkeratosis. The fourth interdigital space is the commonest site because of the ideal conditions for growth. The season of maximum is reached in September, with May as the second highest month.

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Dr. Charles J. White recently read before the American Dermatological Association his paper on "A Problem in Dermatological Diagnosis. The Question of Epidermophyton Infection. Based on the Study of 192 Private Cases." He finds that the condition is often not recognized and that its distribution over parts of the body other than the hands and feet is much wider than indicated in the literature.

In 63 of Dr. White's cases, the thighs and adjacent parts were affected; in 33, the feet alone; in 22, the hands and feet; the hands alone were involved in 21 cases, while the thighs and axillae were both infected in 17 persons and the axillae alone in 11; scattered distribution made up the remaining 26. Among these latter were involvements of the bends of the elbows and knees, the flat surfaces of the trunk and extremities, and one case covering the scalp. As to age, his cases were largely in the second to fifth decades, though the very young and the very old did not escape. The cases lasted from a few days up to eighteen years, but the usual duration was from two weeks to four months. More males than females were involved—74 males to 18 females in cases of the thighs and 49 males to 19 females in foot cases, while in cases affecting the hands there were 29 males and 23 females.

As it occurs on the thighs Dr. White's picture of the lesion is that of a "slightly elevated, sharply bounded, distally rounded, red or brown-red or yellow-red, delicately and generally homogeneously scaling area with little if any accentuation of the periphery in untreated cases." It is often bilateral and covers small or great areas. Improperly called "inguinale," instead of the groins, the epidemophyton infects the scrotum, penis, labia, perineum, anus, intergluteal folds, and accidentally only the pubes, abdomen and umbilicus. There are various anomalies as to moisture, redness, white vesico-pustulation, and degrees of infiltration, papulation, lichenification and pigmentation. The perineum becomes rough, thickened and pigmented; the scrotum is very red and glazed and its rugae are obliterated. The penis reacts as it does to irritants and shows redness, slight infiltration, rare scaling and frequent moisture. On the pubes, the disease may readily be mistaken for eczema seborrhoicum and is apt to be multiple. At the anus and anal fold maceration occurs. The area has a dirty white center and an angry, moist periphery. The condition on the labia, dry, thick with slight scaling and much itching, causes confusion as to eczema and pruritus.

Of Dr. White's cases involving the feet, there were 57 of toes and their interspaces, 41 of the sole or arch, and 12 of the dorsum. Deep vesicles were seen in 22; soddenness was present in 15; hyperidrosis in 12; yellow callusses appeared in 4. In cases appearing on and between the toes, exfoliation followed hyperidrosis and left red surfaces. Fissures were

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common. In less moist cases lamellated exfoliation occurred, and often there was white soddenness or wrinkling. The lard-like masses between the toes could be detached.

Traveling back on the foot, the lesion was apt to be dry, with a serpiginous border. The dry vesicular type often became pustular. A cribriform appearance was noted after the breaking of the pustules. Thick, yellow callusses, with superficial scaling, represented another form. Sometimes the nails showed pigmented subungual hyperkeratoses and were thick and dull.

Dr. White mentioned as reasons for differences in the condition on the hands and on the feet that the horny layer of the skin of the hands is thinner, it is better aerated and more exposed to substances noxious to the parasite. The vesicles were less deep in his hand cases; maceration was less and eczematization was more marked. Sometimes the natural lines of the palm were multiplied and pigmented.

On the larger flat surfaces of the body the lesions may be eczematiform, psoriasisiform, pityriasiform or lichenoid, but the lichenoid cases appeared only on opposed areas of the upper thigh. The resemblance to seborrhoic eczema was often very marked. If not over stimulated or infected, the disease was apt to remain superficial and dry. Remedies usually successful in the treatment of the simulated conditions were resisted. Dr. White noted that these cases disappear in the winter and recur in the summer. Cases simulating pityriasis were rare.

The mycology of the case reported in this paper could not be studied. The similarity of its appearance, distribution and development to those of other known cases, its prompt subsidence under treatment by Whitfield's ointment, together with the confirmation of the findings by Dr. Charles J. White, make the clinical diagnosis sufficiently definite.

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DIPHTHERIA IN THE AMERICAN EXPEDITIONARY FORCE

By Major MARCUS P. NEAL and Captain ALAN C. SUTTON, M.C., U. S. A.

Concluded

Diphtheria in the Savenay Hospital Center

THE SAVENAY Hospital Center, quite similar in every respect such as size, construction, etc., to the two already mentioned, also suffered from a diphtheria outbreak. This epidemic offered the same problems of control. It made its appearance somewhat later, reaching its climax in the second week of December. Thirty-two new cases of diphtheria occurred in the center during December (19 of these were between December 4 and 13). The control measures consisted in culturing and Schick testing all people in a ward following each new case. Twenty-eight carriers were located in December; 4,768 Schick tests were performed, of which 24 per cent were positive, and these men were immunized. Then, as most of the new cases occurred among new arrivals, the system was adopted of Schick testing all cases on admission and all hospital personnel replacements. The result of the Schick test was recorded on each man's service record. All showing positive tests were immunized, and only those with negative. Schicks were allowed to work among diphtheria cases. The epidemic was gotten well in hand and kept under control.

Diphtheria in the Third Army

During the fourth period, dating from the signing of the armistice, the diphtheria problem was practically confined to the Army of Occupation. The combat divisions, once more becoming stationary, were located in areas where contact with civilians permitted a reintroduction of contagious diseases, for there were a number of cases among civilians, especially in Coblentz and the larger towns across the Rhine where the 2d Division was located. Besides, the conditions of hospitalization were such that the presence of an infectious disease such as diphtheria again became distinctly a divisional problem although under army control, for evacuation to the hospital centers in the S. O. S. of such cases ceased, and reports of diagnoses made in the hospitals near at hand were again rapidly referred back to the organization, where such work as the protection of contacts, the location and withdrawal of carriers could be carried out. The official control was in the hands of the epidemiologist and sanitary inspector of the 3d Army. Laboratory work was directed from the 3d Army Laboratory at Coblentz.

Diphtheria became very generally scattered throughout the differ-

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ent units. In February there were 110 cases in the 3rd Army (strength 250,614), the highest number for any one month, and at this time was approximately one-third of all the cases of diphtheria in the A. E. F. (strength 1,661,000), although less than one-sixth the strength was represented in the 3d Army. Diphtheria was the most prevalent of all reportable diseases in the 3d Army. The following table and summary (Tables I and II) shows the wide distribution of cases and also a remarkable constancy in the incidence among the various organizations. Fifty per cent show an annual rate per 1,000 between 4.0 and 4.9. The highest is in the 2d Division and Army Troops (both having the rate 7.5). The 2d Division had the greatest number of men and the smallest area. It also had a high incidence of other respiratory diseases. The Army Troops include the personnel of the evacuation hospital where the cases were concentrated. 19.2 per cent of all cases occurring in the Army Troops were in the personnel of this hospital, although it represented only a small fraction of the strength of the Army Troops.

TABLE I.—*Diphtheria in the Third Army (January 1, 1919, to April 29, 1919)*

Organization	Number cases	Mean strength	Annual rate per 1,000
3d Corps	12	10,400	3.5
1st Division	39	24,200	4.9
2d Division	71	29,000	7.5
32d Division	31	24,600	4.1
4th Corps	12	8,700	4.2
3d Division	28	27,700	3.1
4th Division	32	24,300	4.0
42d Division	25	24,500	4.0
7th Corps	8	5,400	5.9
89th Division	29	2,700	4.1
90th Division	19	20,900	2.8
Army Troops	59	24,200	7.5
Total	367[1]	245,600	4.6

TABLE II.—*Incidence of Diphtheria by Companies, Third Army (January 1, 1919, to April 29, 1919)*

Companies having 1 case only	209[2]
Companies having 2 cases only	50
Companies having 3 cases only	10
Companies having 4 cases only	4
Companies having 5 cases only	1
Companies having 6 cases only	0
Companies having 7 cases only	1
Total number of companies involved	275

[1]All are bacteriologically proven cases.
[2]76 per cent of all companies involved.

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There were only five deaths, giving a mortality rate of 1.36 per cent. Control measures consisted chiefly in the enforcement of early diagnosis with rapid isolation of cases, suspects and contacts. General sanitation and quarantine were depended upon since the conditions permitted their rigid enforcement. Cultures and Schick tests were not much used because of the widely scattered nature of the cases.

Clinical and Pathological Features

1. *Clinical Features.*—Of the clinical features little can be said, unless one were to repeat the usual text-book descriptions of diphtheria, which are, or should be, well known by all medical men. Anyway, such known descriptions do not belong in the field of a paper such as this. One thing of particular value, however, was learned by most men in the A. E. F., though usually, sad to state, after a regrettable experience. They learned to regard and treat all cases of sore throat, particularly those in which a sign of membrane can be detected, as diphtheria until proved otherwise. During the early days, and especially during the epidemics in the spring of 1918, the medical officers displayed a strong hesitancy to make a clinical diagnosis of diphtheria, or even of diphtheria suspect. Even cases showing a heavy membrane over tonsils, fauces and pharynx, and associated with marked clinical symptoms, were called anything but diphtheria. In some instances it was difficult to get the company and battalion surgeons to send such patients to a hospital There was an inclination to hold such cases as Vincent's Angina, tonsillitis, etc., until proved to be diphtheria. How much of that was due to ignorance of diphtheria and what to the belief that diphtheria was not a factor to be considered in an army is not known, but it is believed that each played a prominent rôle. Many of the officers had the firm conviction that "Diphtheria is a disease of minor importance in the Army," as is stated by Havard in his book, "Military Hygiene," and under the paragraph, "Susceptible Age," of the chapter on diphtheria in Medical War Manual No. 1, Second Edition, Sanitation for Medical Officers, we find this statement: "After this period, the percentage gradually rises until among adults 90 per cent are immune. From this it will be seen that while diphtheria may occur among soldiers it is not apt to become epidemic."

Some cases of wound diphtheria were seen by American and French observers. Cultures from some wounds showing a whitish-like membrane yielded a diphtheria-like organism; these were not in many cases proved to be B. diphtheria, because of the inability to obtain animals for inoculation purposes. In some instances, however, they were proved by animal inoculations to be virulent strains of B. diphtheria. The treatment

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of such cases with antitoxin resulted in early improvement. Sufficient experience was not obtained to determine the effect of the local use of antitoxin, or to determine its value as compared to non-immune or non-specific serum. No statistics on the prevalence of wound diphtheria in the A. E. F. are as yet available.

2. *Pathological Features and Autopsy Findings.*—Among bacteriological findings of autopsies done on 4,500 cases of pneumonia the B. diphtheria was recovered in five instances; once from a bronchus, and four times from the consolidated pneumonia areas.

The following table classifies the 13,246 autopsies according to nationality of the deceased, and gives the number of deaths from diphtheria in his groups:

Nationality	*Number of autopsies*	*Number of deaths from diphtheria*
American military (officers and soldiers)	12,825	23
American nurses	30	1
Civilians	43	0
French	54	0
British	15	0
Italian	14	0
Russian	10	0
German prisoners	255	2
Total	13,246	26

Death here recorded are those stated on protocols as due to diphtheria Some deaths in which diphtheria was mentioned as a contributory diseases are not included, because at present the number is not known, and it will necessitate going over each of the 13,246 protocols to obtain this information as no cross-index system has as yet been started by the museum on the protocols.

Of the deaths, twelve occurred during the acute stage of the disease. Of the others, eleven died from later complications or contributory diseases such as pneumonia, broncho-pneumonia, etc. From the available records three of the deaths cannot be stated as being due to diphtheria; in fact they are regarded as probably not due to diphtheria. Of this number, two are stated on protocols to be due to diphtheria merely because a diphtheria-like bacillus was recovered from the throat cultures. (The organisms were not proved to be diphtheria bacilli.) In neither of these two cases was there any record of clinical diphtheria or of a membrane being present at autopsy. In the third case, diphtheria can be said to have beenat the most only a contributory cause. In this instance the case was one of a streptococcic pneumonia. The

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streptococcus hemolyticus was recovered from the blood stream. The patient complained of sore throat two days before death and the bacillus diphtheria was obtained from throat culture. The diphtheria in this patient was a terminal disease and was only a contributory cause of death.

Of the deaths occurring during the acute stage of the disease, one case in particular is cited, first because of the use of surgical procedure during the course of acute diphtheria, and secondly on account of the reported recovery of the bacillus diphtheria from the heart's blood at autopsy. It is the case of ———, ———, 849170, Private, 3d Bakery Company. Clinical records of the case are not available; therefore these cannot be given in detail. The brief notes on the protocol, however, state that the patient complained of sore throat and the usual symptoms seen in diphtheria. Throat cultures revealed the presence of B. diphtheria. Examination showed the presence of a membrane on tonsils and in addition some local swelling around one of the tonsils, which was thought to be a peritonsillar abscess. In spite of the clinical picture of diphtheria and the laboratory findings of the B. diphtheria, the supposed peritonsillar abscess was opened by surgical methods. After being well opened, blood escaped but no pus was found. Later during the day, the record states, a tube was inserted in the trachea (does not state whether intubation or tracheotomy). Some hours after the surgical operation for supposed abscess the patient died. The autopsy findings were those seen in the usual acute laryngeal, pharyngeal, and tracheal diphtheria. The bacillus diphtheria was recovered from tonsils, pharynx, trachea, and the heart's blood. These cultures were later proved by animal inoculation. It is believed that the presence of the organism in the blood was due solely to a mechanical invasion and not in any way due to a bacteriaemia. It is believed that while operating in and through a diphtheria field, the organisms were mechanically introduced and washed into the blood stream.

Treatment

In treatment, nothing new was brought out. Favorable results obtained by the early administration of large doses of antitoxin, followed by a second and a third dose after two to five day intervals, even if the patient is in good condition, emphasize the importance and value of this procedure. The unfavorable results obtained in some of the cases can be properly attributed either to delay in administering antitoxin, to an insufficient dose, or in the failure to give a second and third dose. Myocarditis, cardiac paralysis, post diphtheritic paralyses of optic, laryngeal and other nerves, a prolonged convalescence, a certain number

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of carriers, and an increased number of days lost by individuals, are the results of this inadequate method of treatment.

Means and Methods of Control

1. *Selection of personnel.*—The most important single factor in the control of any epidemic is in the selection of the officer who is sent out in charge of the field work. He must be a trained bacteriologist, epidemiologist, and sanitarian. He must have sufficient knowledge of the general problems that confront, not only the medical officers of a division or other organization, but also the line officers, so that he may be able to appreciate their viewpoint and weigh it from a military standpoint in relation to his own, should they conflict. Also his own recommendations will be the more practical because of this knowledge. The value of a pleasing personality and a large amount of tact are obvious when one considers how frequently this work requires a junior officer to enter a division or other organization and make changes in methods already in use, which he can demand, if necessary, even in the face of opposition, since he carries the authority of the Chief Surgeon's office with him.

2. *Equipment.*—The equipment that is necessary depends entirely upon the size and nature of the epidemic and the method of procedure that one elects to use in that special case, for to a large extent each out break, even of the same disease, offers special problems which require individual consideration. The choice of equipment, however, is the simplest phase of the work. In general the requirements are adequate incubator space, sufficient media and throat swabs. When possible, an already established laboratory in the vicinity is used such as will be found at a hospital center or a camp hospital that cures for the sick of the troops among whom the outbreak has occurred. With a division, however, it was almost always necessary to reënforce their small portable equipment. For this purpose it is essential to have an automobile laboratory. This is stationed at a central poimt where it can be equipped with the amount and type of media, etc., required by the epidemic and sent out on short notice all ready to go at once to work.

For diphtheria work it is also essential to carry on hand, at some place that is easily reached, a large amount of both antitoxin and toxin. The former is for both therapeutic and prophylactic uses, while the latter is used in the Schick test for the determination of susceptible individuals. These two articles, which cannot be made on short notice, must consequently be carried at all times in amounts adequate to meet any possible emergency. To attempt to economize by carrying a

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small amount of these articles is as criminal as leaving a city without a fire department because it hasn't used one for six months. The ordinary supply officer is not as a rule a good man to trust with the determination of the amount to be carried on hand.

3. *The Use of Throat Cultures.*—The throat culture is about the oldest and most generally used single procedure in the control of diphtheria, and yet even this can stand a little thought. In the search for carriers a certain percentage are always missed in routine culturing. As extensive culturing requires a lot of work and, since the one or two carriers missed by obtaining a negative culture from a positive throat may even nullify all the results that one would otherwise get by withdrawing the carriers found, careful attention to small details in culturing a throat that often make the difference between the culture becoming negative or positive, are essential. The points to be watched are: (1) The Loeffler's Media must be of good quality. The most important single factor is that it must contain plenty of moisture as indicated by the presence of some water of condensation in the tube. This is especially important if a small size 3-inch test-tube is used, as is frequently essential on account of a limited amount of incubator space. (2) The swabbing of the throat must be done with care. A good light is essential. The swabbing must be passed over both tonsils and then across the posterior pharyngeal wall while strong tongue depression is maintained. The pharynx should be swabbed last, as this is likely to gag the patient, filling the throat with mucus, which interferes with further swabbing. If any membranous condition is present, a piece of this should be detached and cultured. Throat swabbing, especially where large numbers have to be done, is very likely to become slipshod as one's attention to small details fatigues rapidly. If this is allowed to occur, the results are likely to be misleading and dangerous. Our work has shown that extensive culturing in the search for carriers is only justifiable when a maximum of care is taken, for otherwise the results obtained do not even equal, let alone counterbalance, the work expended, which could have been devoted to placing more attention on other measures. Besides, it frequently gives one a false sense of security and a sense of protection in feeling that he has done all there is to do. (3) Finally, care must be taken that the inoculated culture tubes are not exposed to direct sunlight, as this is fatal to B. diphtheria.

4. *The Schick test.*—The Schick test is probably the most discussed of all measures used in diphtheria control in the Army unless it is the routine search for carriers in large units. One thing we think stands out clearly as a result of our experience in the A. E. F.—the culturing

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of large numbers of men and the withdrawal of the few carriers found by a single examination is useless unless it is at the same time associated with the use of the Schick test on each man followed by the immunization of all who show positive reactions. Furthermore, our results warrant the conclusion that when this combined procedure can be carefully and thoroughly carried out by trained personnel, in organizations of company or even battalion size, while living under anything approaching favorable conditions, the epidemic of diphtheria will be brought to an end in the quickest time possible with our present knowledge. It is understood that such other measures as general sanitary control, the early diagnosis and isolation of all clinically suspicious cases, at least daily throat inspections of the entire group and the careful quarantine of contacts as hereinafter described, will at all times be strictly enforced. When necessary because of a military emergency, a great deal can be done with these latter measures alone, but results will not be obtained as quickly or as surely as when the withdrawal of carriers and the immunization of susceptible individuals are used in addition. In a number of instances in our work, especially in the 32d Division, companies were completely cultured, all carriers found were removed, and yet new cases kept appearing. Then upon reculturing and immunizing those indicated by the Schick test, the continuous appearance of new cases was brought to an end. Likewise the Savenay Hospital Center, after its epidemic of diphtheria, continued to have cases develop among new patients shortly after arrival, although a careful search had been made for likely carriers. The adoption of the procedure of doing a Schick test on all patients at the time of admission, followed with immunizing all susceptibles, brought this trouble to an end. Furthermore, the quarantine of contacts may be considerably shortened by the use of both the throat culture and Schick test. Instead of holding the contacts from ten to twelve days, the maximum incubation time, it is safe to release them twenty-four hours after all susceptibles have been immunized. This shortens the quarantine to three days if the laboratory work is begun at once. This also allows enough time to make two examinations for carriers on successive days, provided the number is not too great or the available help too meagre. This has the value of picking up some who had negative cultures the first day. It is recommended that the contacts giving positive Schick reactions be held twenty-four hours longer after immunization so as to allow for the absorption of the antitoxin and thus assure the protection it accords the susceptible individuals. A case that gave a positive Schick reaction developed diphtheria during the period of the Schick test before antitoxin was administered.

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The Schick test showed that, on an average, about 20 to 25 per cent of susceptibles are present in any given group of soldiers. This checks fairly well with most immunity rates, which accord a natural immunity of 50 per cent and an acquired immunity of 25 per cent, upon reaching the 21st year.

Some are opposed to the prophylactic use of 1,000 units of antitoxin on the ground that the artificial immunity which it confers is too transient (ten to twenty days). However, our experience shows that this immunity at least tides the susceptible individual over the period in which he is exposed to diphtheria both at the height of the epidemic and until it is largely controlled. We have a record of only one case developing in an immunized man. He developed the disease twenty days after receiving the antitoxin (1,000 units). At the same time we did have several cases in men living under the same conditions who had not been given the prophylactic dose of antitoxin because of having negative Schicks. It is generally admitted that the use of the Schick test is of great value in selecting the personnel to do the work among diphtheria patients. By limiting this work to only those with negative Schick tests, the chances of the attendants acquiring the disease are greatly diminished. A copy of the instructions from the Central Office for carrying out the Schick test and making the fullest use of it is given below as a basis of information for routine procedure. During the epidemic at the Allerey Hospital Center, where the work of doing the Schick tests was divided up among teams, it was found essential to insist on a uniform technique and interpretation in order to avoid misleading results. The following circular was issued from the Central Office in order to secure uniformity.

SCHICK TEST

The value of the Schick test, when properly performed, as an index to the immunity or susceptibility of an individual to diphtheria has been definitely established. In general, its use in the control of diphtheria has been outlined in Circular No. 60 of this office. Unless carefully performed and correctly interpreted, however, it may be of little value or even misleading.

Its reliability therefore may be said to depend entirely upon the following four factors:

1. The use of a properly diluted and potent diphtheria toxin.
2. The use of a control test with heated toxin.
3. A proper technique with suitable instruments for making the injection.
4. A correct interpretation of the reactions.

1. The *toxin* usually is issued in a standard outfit consisting of a capillary tube containing a definite amount of standardized toxin, a bottle containing 10 c.c. of sterile salt solution and a small rubber bulb for expelling the toxin into the saline (directions given in each packet). The toxin has been so standardized that 0.2 c.c. of the saline dilution equals 1/50 M. L. D., the amount to be given. The diluted toxin must be used within 48 hours, as it soon deteriorates.

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2. *The control test* with heated toxin. The capillary tube containing the toxin is immersed in water heated to a temperature of 75 degrees Centigrade for a period of 5 to 10 minutes. With a sterile pipette 3.33 c.c. of the saline solution are withdrawn from the bottle, leaving 6.66 c.c. With this 6.66 c.c. of salt solution the heated toxin is mixed. 0.2 of this dilution is used for each control.

3. Technique of injection. A one c.c. Luer or tuberculin syringe and a 25 gauge needle may be conveniently employed for the injection. The syringes may be obtained by requisition.

The skin over the flexor surface of both arms is cleaned with alcohol and 0.2 c.c. each of the test and control solutions are injected *intradermally*. For the sake of uniformity the right arm will be used for the test and the left arm for the control.

It is absolutely essential that the injection be made intradermally, otherwise the test is of no value. A good guide consists in keeping the oval opening of the needle in an upward direction as it is introduced. It should be visible through the superficial layers of the epidermis when the injection is made. A properly made injection is manifested by a small, elevated, blanched area, or wheal, the size of a split pea, which stands out sharply at the margins from the surrounding skin and shows on the surface the prominent openings in the hair follicles.

4. *Interpretation of the reactions.*—The best results are obtained by making two readings, one at 48 hours and one at 96. Ordinarily the two readings should be made, but at times of great urgency the 48-hour reading will suffice.

(*a*) *The positive reaction* represents the local irritant effect of diphtheria toxin and indicates the absence of the necessary amount of antitoxin in the individual to protect against diphtheria. At the end of 48 hours the site of the injection (right forearm) shows a moderately red area about the size of a five-cent piece. The control is negative. At the end of 96 hours the area of redness is deeper in color, sometimes shows a slightly darker center, and is sharply defined. The control is still negative. During the next few days the test area shows less redness and an increasing brownish pigmentation with superficial scaling. The pigmentation may persist for weeks. Considerable variations in the intensity of the reaction to the diphtheria toxin may occur, indicating varying amounts of antitoxin in the blood of the person tested, but not sufficient to protect against diphtheria.

(*b*) *The pseudo-reaction* indicates a local anaphylactic response to the diphtheria bacillus protein. The protein, unlike the toxin, is not destroyed by heating to 75 degrees Centigrade, and the reaction therefore occurs at the site of both the test and control. At the end of 48 hours there develops, on both arms alike, an area of redness and local infiltration, which usually reaches its greatest intensity in 36 hours and begins to fade at the end of 48 hours. The redness becomes less sharply circumscribed and begins to show a brownish-red pigmentation, and at the end of 96 hours there remains an irregular, poorly defined blotchy area of brownish pigmentation with generally a slightly darker center and in the more intense reactions some superficial scaling. Like the positive reaction the pseudo-reaction may vary considerably in intensity. If the reactions are the same on both arms, the individual may be considered immune.

(*c*) *The negative reaction* indicates that the individual has sufficient antitoxin in his blood to neutralize the toxin and is, therefore, immune to diphtheria. The skin remains normal in appearance both at the site of the test and control.

(*d*) *The combined reaction* evidences an anaphylactic response to the protein and also the lack of sufficient anti-toxin to neutralize the toxin. It is, therefore, the combination of a pseudo-reaction and a positive reaction in the same individual.

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He is consequently not immune to diphtheria. At the end of 48 hours there occurs an area of redness and infiltration both at the site of the test and of the control. The reaction at the site of the test may be more active. At the end of 96 hours the pseudo-reaction has begun to fade rapidly and only an irregular blotchy patch with some pigmentation remains at the control area, while at the site of the test the positive reaction now appears distinctly.

5. In recording results, the *positive* and *combined reactions* will be classed together and recorded as *non-immune* and the *negative* and *pseudo-reactions* will be classed together and recorded as *immune*. The results and date of the test will be entered upon the individual's paybook.

6. *Application of the Test.*

(1) *In hospitals:*

a. Selection of immune individuals as attendants to diphtheria cases.

b. When a case develops in a ward all others in the ward should be tested for immunity and those not immune, immunized by the injection of 1000 units of antitoxin.

c. When it is necessary to put diphtheria in wards with other contagious diseases it is desirable to determine the immunity of those not suffering from the disease and immunize all non-immunes.

d. When diphtheria has occurred generally and to any extent all admissions to the hospital should be tested and, if indicated by the situation, the non-immunes either actively or passively immunized.

e. When evacuation is urgent, contacts with diphtheria cases may be evacuated provided their throat cultures are negative and the non-immunes have been determined and immunized.

(2) *In the field:*

a. In determining immunity of intimate contacts with a case of diphtheria, those found to be susceptible may be immunized if indicated by the prevailing conditions.

b. When diphtheria occurs in isolated detachments or groups of individuals who are to be without immediate medical attention, the non-immunes should be determined and immunized.

c. When diphtheria has occurred extensively through a command, and especially if the troops anticipate conditions which preclude the proper enforcement of other measures of control, it may be advisable to test all in the command for immunity and actively or passively immunize the susceptibles. The advisability of such measures, however, must necessarily depend on the existing conditions.

5. *Diphtheria Carriers.*—In general one may say that extensive search for carriers and immunization of susceptibles should be omitted when diphtheria is occurring only in a sporadic, endemic form, but should be used without delay during every epidemic, provided military conditions permit.

The extensive search for carriers during the endemic type of diphtheria is almost useless, for here we have to face the following fact. A certain percentage of the carriers present will not be found. Of those that are found under these conditions, only a certain small percentage will be virulent. Also, in a company of 250 men, you may find a virulent carrier and at the same time miss one. However, it is always well worth while to look for carriers among the intimate contacts with each

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sporadic case, and, when involved in an epidemic, search systematically in the entire organization up to and including battalion size, for here these men who are carriers as a result of contact with a fresh case are very largely of a temporary type which clears up rapidly and are also very likely to be virulent. The question of treatment of carriers is a universal stumbling block. Carriers resulting from intimate contact with an acute case are usually very transient and clear up after ten days or two weeks. Antiseptic sprays of many kinds have been tried to clear up the carrier condition, most of which give equally good results in active carriers and, besides, probably have little to do with the disappearance of the bacilli, since about the same percentage clear up untreated. Acriflavine does seem to give somewhat better results than the others. Tonsillectomy seems to be the only thing which will clear up chronic carriers. It is important to wait several months after acute diphtheria before operating, as the tonsil is likely to harbor a virulent streptococcus for some time during convalescence. Cases have resulted fatally from septicemia following too early operation. The investigations at the Mesves Center emphasized the importance of keeping a record of all who were ever known to be carriers of diphtheria. During the epidemic several carriers were found among the nurses and enlisted personnel who previously in the United States had been found to be carriers but were later released upon three negative cultures. If it were known that certain persons had been carriers, they could be placed in positions where a recurrence would not be vital and could be checked up either at regular intervals or at the first evidence of new cases of diphtheria among their companies.

A varied and large amount of individual work was done on carriers in various camp, field and base hospitals, but little was accomplished, and no one thing stands out as being of greater value than many others. In view of such unpromising conditions and in order that the carrier problem in diphtheria and meningitis might be taken up with coordinated action upon a true scientific basis, under proper control, and to insure that the experience and knowledge gained would be utilized on new cases, plans were formulated at the Central Office and approved by the Chief Surgeon, A. E. F., whereby a hospital was to be converted or a new hospital opened to provide for the concentration of these carriers. Such a hospital near Dijon was under consideration and plans for operating it had been prepared when the armistice was signed. A hospital properly constructed, cubicled, ventilated and equipped with the desired apparatus for spraying chambers, etc., would be the ideal place for concentrating all types of carriers, using separate buildings, messes, etc., for men who are carriers of different organisms to avoid cross infection.

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It was planned that, as these men were not sick, they would be used on some type of outdoor labor, preferably on a farming project, as a means of keeping them in the open, occupied, and producing such food as could safely be dispensed to neighboring troops, as well as utilized at the hospital. These plans, however, were given up, for it was thought that the military plan for the early return of troops to the United States would probably interrupt this work before it had been sufficiently long in use to warrant any definite conclusions of value and render the additional expenditure of time and money unjustifiable.

6. *The use of general sanitary measures.*—Upon the outbreak of diphtheria in any command the first thing to do is to make sure that all the barriers to its spread are intact. These barriers include the thorough boiling of all mess-kits after each meal; avoidance of overcrowding in barracks, even if this requires the temporary use of shelter tents; the sunning of all blankets twice a week and the prevention of unshielded coughing and sneezing or spitting on floors. We found it wise to concentrate on the enforcement of a few essential things rather than issue a long list of instructions covering all the smaller details. Also it is important to make sure that all recommendations can be carried out before having them issued as orders.

The Procedure Recommended for Handling Diphtheria Outbreaks

The rest of this paper is devoted to a consideration of some of the chief obstacles which were encountered in the control of diphtheria in the A. E. F. and the methods of attack recommended for use under the different conditions likely to be met with in the Army. It is easy enough to work out a thorough plan of control which cares for every detail and say "Do this, and your diphtheria will stop." But, in the Army, especially during a campaign, one must always remember that diphtheria is only one of many problems to be cared for, and the plan for control must always take into account the military plan. Military expediency may require a plan to be changed over night and reduced to the absolute essentials only, throwing aside part of the work in spite of the fact that everyone knows it gives a greater degree of certainty to success. It may be dispensed with, however, if this work is less than the risk subsequent to carrying out the complete plan and thus interfering with the military plan of campaign. Also unavoidable limitations in the number of trained men available for assignment to the control of an epidemic may cause one to follow out a mode of action far short of what he knows is the ideal procedure under the circumstances.

The greatest factor to be taken into account, however, and the one most likely to defeat the successful outcome of one's plans is the natural shortcomings of the men on whom one has to depend for carrying out

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many of the details of any plan. Usually it is due to the failure on the part of some medical officer on duty with the troops to be fully awake to his responsibilities or to a lack of appreciation of the importance of the measures he is expected to carry out. This must be anticipated and taken into account in one's work. After a little experience one can quickly tell how much instruction is going to be necessary and what degree of coöperation he can count on as a result of the preliminary sanitary survey which one always makes before outlining his exact method of procedure in a given control problem. Such things as dried expectoration on barrack floors, dust and dirt under bunks, or inadequate facilities for the boiling of mess-kits are an excellent index of the degree to which you can expect your quarantine instructions to be carried out. Or course you know that in case your instructions are neglected you can court-martial someone later. That, however, does not enter into the matter, for failure to control the diphtheria may follow the neglected instructions, which entails the suffering of men, and perhaps even military success has been jeopardized which, like spilled milk, cannot be remedied no matter how well one can explain his failure. The plan determined upon must be carried out; it must anticipate the things which will cause its failure and circumvent them. This requires tact, judgment, and a thorough knowledge of not only the medical problem but, to a considerable degree, the line problem as well.

In the initial survey it is also very important to tactfully find out how the internal administration of the division, or whatever organization it may be, is running; whether there are points of friction, or personal peculiarities, etc., that must be taken into account from the start to insure success. In handling any epidemic one must succeed. Personal pride, etc., must sometimes be sacrificed for the moment. Any such matters can be straightened out later but cannot be tolerated to hold up the work of control. Here is an example of a difficulty in internal administration which was encountered in one epidemic. There was no coördination of the work. The division sanitary inspector and the division laboratory officer each thought the other was useless. It was due to a lack of appreciation of the scope or importance of each other's work due to ignorance and jealousy. This was reflected in some of the difficulties they were having in putting a check to the recurrences of diphtheria, besides resulting in a lot of unnecessary work for both. In other instances, fresh contacts supposed to be held in quarantine were found on duty in kitchens, or even walking unrestricted outside of the village in which they were stationed. Again, the letter quoted below gives another example of the failure on the part of a medical officer to do his full duty.

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MEMORANDUM FOR THE DIVISION SURGEON———DIVISION.

1. Report on a case of clinical diphtheria seen at ———— today, patient's name ———, ———, Pvt. 1 Cl., Hq. Company, ——— Infantry, stationed at ————. This soldier stated that he reported sick last night (May 2) at 7 o'clock to the camp infirmary complaining of sore throat, chills and fever. Medical officer was present at this time, but did not examine patient. The sergeant, however, prescribed some powders. Patient again reported at sick call today (May 3) at 8 a. m. and was at this time seen by the medical officer who took throat cultures, gave him three shots of antitoxin in the left arm and placed patient in camp infirmary.

2. At 2.45 p.m. accompanied by Captain ——— of the Sanitary Corps, N. A., I visited this camp infirmary and found the doctor absent. He had left orders with the sergeant, to keep the patient in the infirmary until he returned later in the afternoon unless the patient had fainting or vomiting spells. At the time of our visit to the infirmary, the patient was in such condition that it was deemed advisable to take him to the hospital at once, which I did with my own conveyance. Patient reached the hospital with a pulse of 120 and a whitish-gray membrane covering the pharynx, both tonsils, pillars of the tonsils and uvula. Uvula and pharynx badly congested. Uvula markedly so.

3. It was possible for this patient to have been sent to the hospital by either of two ambulances which went through————previous to the time that we arrived there, one ambulance passing through the town in the forenoon, the other at 1.30 p.m. The driver of the second car inquired from the sergeant at the camp infirmary if any patients were to be sent to the camp hospital, and was given reply that there were none.

4. In view of such conditions, the diphtheria epidemic which is existing at the present will not be easily controlled.

It is easy to see how such things as these may undo all the work one is trying to do. In order to secure the best results one must not be surprised by such things, but rather expect them and, by being on the lookout for them, counteract them before they do harm.

When the first case of diphtheria occurs in a command, the case itself should at once be isolated. The entire company or barracks should undergo daily throat inspection for ten days. All intimate contacts should be quarantined. They can be released if their throat cultures are negative and their Schick test is negative, or 24 hours after receiving 1,000 units of antitoxin if their Schick test is positive. If these controls are not available, the quarantine should cover the maximum ten to twelve day period of incubation. The clothing and bedding of the patient should be disinfected. Should secondary cases develop, the entire exposed command, usually the entire company, should at once be gone over for carriers and immunized on the basis of the Schick test in addition to continuing the rigid enforcement of the general sanitary measures already described. When several cases occur in the same barrack, blankets should be aired daily, sunned when possible, and the entire barrack, bunks, floor, etc., washed down with soap and water.

The early diagnosis and isolation of subsequent cases is the most

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important single factor in bringing the epidemic to an end. If many cases of diphtheria are to be sent to a hospital, this hospital should at once determine the susceptible group in its personnel and immunize them. This will also enable them to assign non-susceptibles to the diphtheria wards and almost surely prevent an outbreak of diphtheria in the hospital personnel which might otherwise seriously interrupt the other work of the hospital. These general rules must be modified by common-sense and experience to suit the various conditions met with.

The Control of Diphtheria in Divisions

In attempting to eradicate diphtheria from a division in which it has become fairly well scattered and where small attempts have not checked the disease, we would say as a result of our experience in the A. E. F. that much time can be saved and a much more perfect control maintained after it has once been secured, if a trustworthy nucleus of the group which brought the initial epidemic under control is left permanently with the division and made responsible to the Central Office for maintaining this control. It is fair to assume that this would not have to be done in many divisions, for out of forty-two divisions in France only two or three were ever seriously concerned with diphtheria. It seems highly likely that after diphtheria is once firmly rooted in a division it will continue to flare up from time to time whenever attention is diverted to other problems, or there is temporary overcrowding such as is usually caused by troop movements.

In handling any outbreak of diphtheria in a division, first make a general survey of the situation. This will include not only the number and distribution of cases, and the specific action already taken to prevent the further spread of the disease; but, as already stated, it will include the general sanitary situation and the internal administration of the division. Next study the general military plan of action of the division. Then, based on these findings, carefully work out and put in writing a complete plan of action. If put in writing, subsequent changes or omissions are more likely to be the result of careful thought than hasty action. In the case of troop movements—embarkation, ocean transportation, debarkation, rail transportation, and during active operations—almost entire reliance must be placed on the early recognition and isolation of every suspicious case. All cases found with sore throats or showing membranes, even without clinical symptoms such as chills, fever, nausea, aches, etc., should be considered as due to B. diphtheria until the laboratory renders a diagnosis.

If cases are diphtheria, contacts should be kept in quarantine until sufficient laboratory examinations have been made to detect carriers

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or cases which might develop from exposure. If cases are found not to be diphtheria, the quarantine is at once lifted.

This requires daily and, if possible, bi-daily throat examinations. This will not be possible during actual fighting. Here dependence must be placed on the men to report early on sick call. This is a very difficult thing to obtain from men during operations unless carefully impressed in advance of its importance. Two points in general sanitation must be insisted on: First, mess-kits must be washed after each meal in boiling water. Second, steps must be taken to prevent flagrant exposure in barracks, either by separating the bunks with shelter-halves or by the use of masks. The latter, if used, requires careful observation to prevent interchange of masks or reversing the exposed side upon reapplying the mask. In so far as possible, immediate contacts will be isolated from three to seven days as conditions permit.

If the incidence of the disease is sufficient to warrant the delay of the divisional movements, and the military situation permits, then the problem becomes similar to that of a division in a fixed area. Under such conditions the following additional methods of control are advised: The withdrawal of all carriers found; the immunization of those exposed individuals shown by the Schick test to be susceptible to diphtheria; the rigid quarantine, until immunization is completed, of all susceptible contacts. Whether the entire organization is to be cultured and immunized, or whether this is to be confined to the actual contacts under quarantine, is a decision which can only be made in a particular case by the officer entrusted with the control work after weighing carefully the various factors, already discussed, which can affect the situation. In general, however, if diphtheria is epidemic and concentrated in two or three companies or battalions, the entire personnel should be gone over with both throat cultures and Schick tests. If it is more or less endemic, and equally distributed throughout the division, it is better to carefully culture and Schick all the immediate contacts of each case or group of cases. If impossible, for any reason, to both culture and immunize, then omit the culturing. When using the culture method, it is important to be sure that every man whom you have decided to reach in your plan is cultured, for the man missed may be the one who is dangerous.

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A MODIFICATION OF THE LYSTER BAG TREATMENT OF WATER FOR FIELD USE

By Major LAWRENCE T. FAIRHALL
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ONE of the most efficient and easiest methods of purifying water for mobile troops in the field is that of treatment with calcium hypochlorite in a suitable container. Numerous other methods have been proposed, varying considerably in difficulty of application, or in transportability of apparatus, but the use of the Lyster bag with calcium hypochlorite as the sterilizing agent is the official method of the United States Army.

At points in the rear, where more careful attention can be paid to the niceties of water purification, it is possible to sedimentate, treat and filter the water supply, thus affording a water of unquestionable purity and palatability. However, these refinements of purification are not possible in the zone of active operations, and, therefore, a method which is at once the simplest and most efficient is employed.

The container officially recognized in the United States service is the canvas bag devised by Col. William J. L. Lyster of the Medical Corps. This bag consists of specially woven flax sewn to a galvanized iron ring, hinged so that it folds at one diameter. At four equidistant points on the ring, pieces of rope are spliced so that the bag may be suspended on any convenient support. Five nickel, self-closing faucets are placed at equal spaces about the bottom of the bag. The purpose of the bagis not for transporting water, but to provide a stationary receptacle in which water can be held long enough to sterilize and then distribute it. The bag when empty weighs about 7½ pounds and may be folded readily for carriage in the field.

After the bag is suspended and filled with water, the latter is sterilized by the addition of a small quantity of calcium hypochlorite. The latter is contained in small glass tubes in quantities of one gram and is supposed to contain about 30 to 35 per cent of available chlorine. This quantity, added to the 36 gallons of water in the Lyster bag, gives a concentration of available chlorine of about two parts per million and is sufficient to render a highly infected water safe for drinking purposes, provided the chemical is given sufficient time to act on the germs present.

In practice, occasional difficulties are encountered with this method of treating water. In the first place, troops have an inherent distrust of anything that is added to the water they are going to drink in the shape of powder or tablets. All sorts of absurd fiction regarding water thus treated finds ready circulation. This is intensified by the fact

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that the water after treatment may have a rank taste due to the hypochlorite present and, after continued use, becomes repulsive. There is often a tendency, as a result of this, to drink the raw, untreated water, followed very often by serious results. Other difficulties that might be mentioned are improper or insufficient chlorination, the inadequate supervision of the process, and wastage in handling the calcium hypochlorite.

Of the various agents that have been proposed from time to time for sterilizing water, calcium hypochlorite still has many advantages. It is one of the more stable hypochlorites, reacts readily with the carbonic acid present in the water yielding hypochlorous acid, and has the advantage of cheapness. However, while calcium hypochlorite is more stable towards changes in temperature and light than most hypochlorites, still it, too, tends slowly to decompose and consequently must be kept carefully stoppered.

The hypochlorite put up in small glass tubes for field use is glass sealed, but even under these conditions it cannot be depended on for constancy in composition, so that its activity must be checked from time to time. A good grade of chlorinated lime will contain 35 per cent of available chlorine. Most samples, however, will show a lower value than this, due to the slow decomposition of the salt. In case the tubes containing it are cracked or have blow-holes, the chlorinated lime may be utterly useless for purposes of disinfection.

For the above reason, the amount of active chlorine available for the disinfection of a water supply is estimated roughly in the field.[1] The method given for this purpose in Medical War Manual No. 6,[2] involves the preparation of a suspension of calcium hypochlorite in 500 c.c. of water and the estimation of the amount of this solution which is stable in a 500-c.c. portion of the water to be treated. Knowing this and the volume of the Lyster bag (36 gallons), the total amount of suspension necessary to chlorinate a bagful of water may be computed. It is recommended for safety, however, that double the calculated quantity be introduced. An excess of chlorine is indicated by the blue color formed on adding ten drops of a solution containing 10 per cent potassium iodide, 1 per cent soluble starch and 0.5 per cent zinc sulphate to a sample of the water.

Although the above method is relatively simple, its actual practice in the field is open to a number of objections. Unless considerable care is exercised in obtaining the small samples of water for the preliminary test, it is conceivable that the samples may not be representative of the water to be treated, that is, they may be more or less

[1] Memorandum No. 7, Div. of Lab. and Inf. Diseases, A. E. F.
[2] Page 338, 1919 Addition.

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muddy, or contain scum, all of which would give a false idea of the amount of hypochlorite required. It is very difficult to prepare an even suspension of hypochlorite in the field, because when mixed with water the salt has a tendency to form lumps; hence in testing this suspension a few drops at a time one may very easily form a false estimate of the amount of free chlorine available for disinfection. The use of starch and potassium iodide offers a number of difficulties when small amounts of free chlorine are to be detected. Potassium iodide solution tends to decompose somewhat on standing, yielding free iodine which will give a blue color with starch in the absence of free chlorine. Starch solution, on the other hand, unless freshly prepared, is not very sensitive to free iodine. The color reaction is subject to certain vagaries, fading out sharply under certain conditions and deepening under others. Furthermore, a more stable indicator, ortho-tolidine in hydrochloric acid solution, is more positive and is six times more sensitive than the starch-potassium iodide test, even when the latter is carried out under the most favorable conditions.[3] A further objection to the field method outlined above is the equipment necessary and the necessity of carrying out a computation to determine how much of the hypochlorite to add. The water, furthermore, after treatment with the chlorinated lime, is left with the objectionable taste and odor of free chlorine. In addition, it is somewhat of a disadvantage that the total time consumed in preparing the water for drinking is in no case less than one hour.

In order to avoid the difficulties enumerated above, and especially that of estimating the exact amount of hypochlorite to add, it would be preferable first of all to overdose with calcium hypochlorite so as to insure sterilization, and then to de-chlorinate, so as to remove the rank taste of the hypochlorite.

For this purpose the following method is recommended: The contents of a tube of calcium hypochlorite (1 gram) are added to a Lyster bagful of raw water, stirring the powder in well and allowing the water to stand from ten minutes to half an hour, depending upon the physical condition of the water. A test should be made immediately after adding the hypochlorite to make sure that an excess is present, and it is desirable that a second test be made at the end of the sterilization period. These tests may be made simply by adding half an ampult of a solution of orthotolidine in hydrochloric acid to a small quantity of the treated water—contained in an ordnance cup, for instance. In the presence of free chlorine, a coloration is produced which ranges in shade from a light canary-yellow to a dark red, depending upon the amount of free chlorine present. At the end of the sterilization period, the rank taste and odor of the sterile water may be removed by adding one gram of

[3] Ellms and Hauser, Jour. Ind. and Eng. Chem., 5, 916 (1913).

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sodium thiosulphate. The free chlorine is at once acted on by the sodium thiosulphate, and the water is ready for drinking. The small quantity of thiosulphate added is scarcely sufficient to alter the taste of the water; indeed, it is difficult to differentiate by taste between raw water and water that has been thus treated. The amount of sodium thiosulphate remaining after treatment is negligible, since only one gram is originally added to the 36 gallons of water and the greater part of this is used up in the reaction with the free chlorine. In this method, the tube of calcium hypochlorite should be emptied directly into the bagful of water and rapidly stirred in by means of a stick. This stick should be left in the water throughout the whole process of treatment, for, if removed and then later used to stir in the sodium thiosulphate, it may serve to reinfect the water. If the test fails to reveal a definite yellow color after the addition of one tube of calcium hypochlorite, another tube should be added and the water again tested.

As dechlorinating agents other chemical or mechanical means may be chosen in place of sodium thiosulphate. The latter was selected because of its stability and the ease with which dechlorination occurs when the salt is brought into solution. Mechanical means—aeration, filtration through charcoal, etc.,—while efficient, are difficult of application at points where the Lyster bag is a necessity. Sodium thiosulphate has the advantage of cheapness, ready solubility, and is practically instantaneous in its reaction with the hypochlorite, so that the process of water treatment is not lengthened unnecessarily.

A series of experiments was run with this method in order to determine (*a*) the reduction in bacteria that may be expected in a given time, and (*b*) the effect of the chemicals used on the taste of the water. These tests showed that there was but very little taste imparted to the water—certainly the water, which after the addition of calcium hypochlorite had the characteristic offensive odor and taste of chlorine, was entirely freed from the latter after the addition of the sodium thiosulphate.

Laboratory tests made with clear tap water heavily inoculated with cultures of colon bacilli showed a satisfactory reduction in the latter a few minutes after chlorination. In fact, ten minutes after the introduction of hypochlorite and also following the addition of sodium thiosulphate, sterile plates were obtained and no gas developed in the fermentation tests after forty-eight hours. With muddy river water likewise inoculated with cultures of the colon bacillus, a reduction of 90 per cent in the bacterial count and no gas development after forty-eight hours was obtained after the water had stood for thirty minutes in contact with the calcium hypochlorite.

These results indicate that from five to ten minutes is a period of sufficient length to insure satisfactory sterilization of clear water.

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Muddy water, however, requires a longer period—a period of at least half an hour to render the water safe for drinking purposes.

Following the laboratory tests, experiments were made at Camp Humphreys, Accotink, Va., for the purpose of simulating field conditions. The samples of water treated varied considerably in physical condition, and water was often selected which was muddy or unpromising in appearance. Water taken from the same source of supply was usually taken at different times, after rainfall, etc., so as to vary the conditions as much as possible. The results of these tests are summarized in Table I.

In the above summary it will be noted that the colon bacilli were destroyed by the chlorination process within a period of thirty minutes in all but three cases. In two of these cases the water was particularly muddy—that from a point in Accotink Creek following a rain and that representing the washings from filter No. 4 at the filtration plant, Accotink, Va. In the third case the water was that taken from a pond and during the chlorination period was found to contain several small minnows, which probably afforded protection for the colon bacilli. For this reason it is advisable to filter the water, even though the action is more or less imperfect, through the top provided for that purpose in dealing with an unusually poor quality of water. All the other tests show a very satisfactory reduction in bacteria count at the end of the half-hour period, and the majority show a satisfactory decrease at the end of the first ten-minute period.

In most cases it was found advisable to add an extra tube of hypochlorite at the beginning of the chlorination, so as to insure a greater excess of hypochlorite than ordinarily used, since with muddy water it was found that the chlorine content decreases from one-half to one and a half parts per million during the half-hour interval—partly due to the oxidation of the organic matter present, and partly due, possibly, to absorption by the clay. Furthermore, it is somewhat difficult to see the yellow coloration produced by less than one part per million of free chlorine in very muddy water.

The materials necessary for treating water according to the method outlined above are: (1) The ordinary tubes of calcium hypochlorite issued with the Lyster bag, (2) 1 c.c. ampules containing a solution of 0.1 per cent ortho-tolidine in a 10 per cent. solution of hydrochloric acid, and (3) tubes containing one gram in each of sodium thiosulphate. The materials are readily put up in this form and are stable. With the chlorinated lime in the brown glass tubes and sodium thiosulphate in clear glass tubes, it is not likely that a mistake would be made very readily, particularly as the instructions call for two distinct tests for chlorine after chlorination.

It must be pointed out in this connection that any such method as

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TABLE I—*Field Tests at Camp A. A. Humphreys, Accotink, Va.*

Source of water	Initial dosage free chlorine, P.P.M.	Raw water		10 minutes after dosing		20 minutes after dosing		30 minutes after dosing		Final chlorine content, P.P.M.
		Bacterial count	B. coli 48 hours	Bacterial count	B. coli 48 hours	Bacterial count	B. coli 48 hours	Bacterial count	B. coli 48 hours	
Treated water	1	7,840	+ 0.1 c.c.	10	.....	20	.....	8	.....	0.8
Accotink Creek	2.5	10,380	+ 0.1 c.c.	120	.....	100	.....	160	.....	2.4
Accotink Creek	2.4	2,540	+ 0.1 c.c.	100	.....	80	.....	60	.....	2.4
Accotink Creek	3.0	600	+ 0.1 c.c.	280	+ 10 c.c.	110	+ 10 c.c.	360	+ 10 c.c.	3.0
Accotink Bay	2.0	600	+ 0.1 c.c.	200	.....	60	.....	40	.....	1.0
Washings from filter No. 4	3.0	400	+ 10 c.c.	270	+ 10 c.c.	470	+ 10 c.c.	60	+ 10 c.c.	1.5
Settled water filtering plant	3.0	300	+ 1 c.c.	60	.....	100	.....	40	.....	2.0
Water from a small pond	4.0	800	+ 0.1 c.c.	90	.....	20	.....	60	+ 1 c.c.	3.0
Potomac Bay 12 ft. from shore.	3.2	1,850	+ 10 c.c.	270	+ 1 c.c.	190	+ 10 c.c.	60	.....	3.0
Potomac Bay 12 ft. from shore.	3.0	1,580	+ 10 c.c.	97	.....	30	.....	80	.....	3.0
Potomac Bay 6 ft. from shore.	3.5	150	+ 10 c.c.	4	.....	8	.....	90	.....	2.8
Potomac Bay 6 ft. from shore.	2.2	3,200	+ 1 c.c.	90	+ 10 c.c.	10	.....	15	.....	1.0
Potomac Bay 40 ft. from shore.	3.0	280	+ 1 c.c.	8	.....	20	.....	10	.....	3.0
Potomac Bay 18 ft. from shore.	3.2	640	+ 1 c.c.	80	.....	60	.....	40	.....	2.8
Potomac Bay 18 ft. from shore.	3.0	300	+ 0.1 c.c.	50	.....	120	.....	25	.....	2.8
Potomac Bay 10 ft. from shore.	2.8	480	+ 1 c.c.	160	.....	50	.....	30	.....	2.7
Potomac Bay 40 ft. from shore.	3.0	100	+ 10 c.c.	40	.....	20.	.....	50	.....	3.0
Potomac Bay 40 ft. from shore.	3.0	220	+ 10 c.c.	50	.....	30	.....	26	.....	2.7

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the foregoing does not aim to produce a pure type of water in the sense of that normally supplied to cities, or even of that possible in the rear. The Lyster bag treatment aims only to convert an unsafe water into a water relatively safe for drinking purposes. It is useful principally in the zone of advance, where transportation is of vital importance and where it can be relied on to help in the ever-constant problem of the health of the army.

It would be preferable, of course, to treat very muddy water with alum and to filter before dosing with hypochlorite, but these refinements call for equipment and delay where time and transportation are of prime importance. Hence it is not reasonable to expect a yield of water highly "purified" in the sense that it is free from any suspended matter and completely sterile. It is sufficient if it is freed from pathogenic organisms. The removal of the excess of sterilizing agent, which gives the water its repulsive taste, is an added refinement, not absolutely necessary perhaps, but bringing some degree of comfort in the continual use of such water.

The main feature of the above procedure is that polluted water may be considerably overdosed with calcium hypochlorite so as to insure effective sterilization, and then made palatable by dechlorination without calling for a great deal of intelligence on the part of the man in charge of the bag.

In operations requiring the use of the Lyster bag, it would be well to organize four water squads for each company, whose duty it would be to control the water supply of the company, and to hold them responsible for the chlorination of the water supply. Each man having carried out the process once, it is difficult to see where there would be any cause for confusion.

A further point might be mentioned—the question of checking up the bags to see whether the water has been treated. Where chlorinated lime alone is used, the sanitary inspector usually tests the bags by adding a little potassium iodide-starch paste to a sample of the water. This test is not applicable to water treated by the method mentioned above. Even though the water has been dechlorinated after treatment, as mentioned, it is still possible, however, for the sanitary inspector to check up on the water by a very simple test. If half a cupful of treated water is added to half a cupful of water drawn from a bag and recently chlorinated, the yellow color obtained with ortho-tolidine is at once discharged on mixing the two, due to the slight excess of sodium thiosulphate left in the treated water.

I take pleasure in this opportunity of expressing my thanks to Col. F. F. Russell and to Lieut. Col. H. J. Nichols for many helpful suggestions and much timely advice.

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OBSERVATIONS AND DEDUCTIONS FROM THE STANDPOINT OF THE UROLOGIST IN DEMOBILIZATION WORK

By Captain KENT V. KIBBIE
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THE persistent occurrence of advanced venereal infections among troops examined prior to demobilization, despite their having been inspected at scheduled venereal inspections and despite their having taken the prophylactic treatment within the allotted time after exposure, naturally leads to the conclusion that either more energetic measures should be instituted in the handling and treatment of these diseases or that the present technique is not carried out sufficiently in detail. Theoretically, the present system of venereal service should make for nearly 100 per cent efficiency, yet practically it has proven very discouraging to many of our camp surgeons. A decline from a maximum of 20 per cent of venereal disease incidence in mobilization to a maximum of 1 per cent in demobilization speaks too well for our present system to hastily brush it aside as imperfect in accomplishing its purpose. It is the probable imperfections that have attracted my attention, and pointing them out may stimulate our medical officers toward perfecting measures for their relief.

It has been my province to be attached to a rather active board of medical examiners as urologist, syphilologist and proctologist, and, in this capacity, to observe the venereal pathology as it passed through my service. The aggressive interest and determination of the camp surgeon in attempting to hold venereal disease at its minimum afforded me opportunity to observe, in addition, the general venereal work in the various organizations throughout the camp.

Being appreciative that only by digital examination can an examiner assure himself of the true condition existing around the inguinal rings, the same method was extended to include the genitalia, with the result that venereals running the gauntlet successfully elsewhere found a stumbling block here. With this method, seldom will pathology escape the examiner, nor will this method, in any measure, dispose to complicate the speedy handling of large groups of men. Twenty-four hundred men have been subjected to this method of examination by one examiner during the average working hours.

The men presented themselves, in groups of from four to six, upon a running board that places the pelvis on a line with the eyes of the examiner. With gloved hands the inguinals are palpated, the scrotum and its contents next. Then, with a backward stroke of the right hand,

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the shaft of the penis is allowed to fall between the index and middle fingers, while at the same time the fingers of the left hand retract the prepuce. A downward stroke of the right hand milks the urethra and empties the fossa navicularis into the spreading meatus. This is a simple procedure and gives a rapid survey of the inguinals, the scrotum and its contents, the prepuce, meatus and surfaces of glans and corona. Questionable discharges are referred to the microscope, and in a few moments a diagnosis is made.

The number of venereal cases exposed by this method is astonishing yet easily explained when we realize the inherent disposition of men to shield their infections. Aside from its thoroughness it does away with the soldier's camouflage. It has disclosed the practice of using pledgets of cotton and pencils of chewing gum in the urethra with the purpose of presenting a dry urethra. It has also disclosed a lesion deftly hidden under the soldier's thumb or finger, or smothered with dusting powders. Even soot and pan-grease (colored trooper's salve), used to mask a lesion, has failed in its purpose. It has laid bare a common practice on the part of those with contracted preputial orifices to constrict the urethra by their own retractions and to hastily wipe the glans in order to present to the casual eye a clean meatus. I have personally witnessed more than one gonorrheic, while milking his own urethra, made to suffer chagrin when the constricted meatus was relieved by the hands of the examiner. Because the soldier resorts to almost any measure that will afford protection against exposure, too much stress cannot be laid upon the needs of *thorough* inspections. Laxity in this respect leads to chronicity and complications in those infected.

It has been the writer's observation that many inspections are mere formalities. Men are lined up for "short-arm" in ill-lighted quarters and at times inopportune for thorough work. They are directed to expose themselves, and the medical officer hurriedly passes down the line. Only palpable cases are discovered so long as the soldier of average intelligence is allowed to perfect for himself a safe camouflage. Frenal lesions, mucous patches, buboes, and incipient gonorrheas are often passed unobserved. If venereal inspections were conducted with the same degree of thoroughness as the general inspections by line officers, our results would be more definite. Few soldiers are unappreciative of the exactitude of line inspections and, consequently, make little effort at deception, while medical inspections of the "flying type" are frowned upon as mere formalities—a game to beat if you can. Ridding these inspections of temptations to deceive and to camouflage by thorough and exhaustive methods will go far toward curtailing its presence among our troops.

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In addition to thoroughness in inspections, I wish to enter a plea for greater consideration of the importance of diagnosis and treatment of venereal diseases in the service. Especially does this apply to work outside of base hospitals. There is a woful disposition on the part of medical officers to overlook the presence of venereal diseases and their various manifestations either through indifference or inability to recognize pathology. Even a tentative diagnosis in many cases is lacking. The following illustrations will suffice for what I have in mind.

Private ———, up for discharge with a large syphiloderm, ulcerative type covering the entire buttocks. Statement: that this had developed in France as a result of the rubbing of his pack; that he had received both hospital and infirmary treatment consisting of ointments and lotions, but received no relief. He claimed that he was compelled to sleep on his stomach on account of this condition. When informed that it was syphilis he bitterly resented the statement. Being held for fourteen days treatment, the lesion had entirely healed.

Corporal ———, up for discharge. Presented an inflamed meatus with 1-inch induration, from which exuded a mild sero-sanguinous discharge. Statement: that this thing had bothered him for two months and that he had been treated for gonorrhea and advised that the reason it did not get entirely well was because of stricture. Held under the diagnosis of urethral chancre and under appropriate treatment was promptly relieved.

Seageant ———, up for discharge. Had two scrotal ulcerative lesions. Statement: that he was chafed and local treatment had failed to relieve him. Held as an ulcerative syphiloderm and was soon relieved.

Lieutenant ———, up for discharge. My attention was directed to his "foggy" voice. A squamous patch was readily observed along the front border of the sterno-cleido-mastoid. Statement: that he had severe laryngeal and pharyngeal disturbance during the last six months of service, and that the medical treatment administered left him with the impression that he was suffering with tubercular laryngitis. General adenopathy, skin manifestations, and Wassermann pointed unerringly to the true malady. After his first treatments, he stated that at last he could eat without pain.

Cases, similar to those outlined above, might be multiplied many times, but these present enough to emphasize the need of constantly bearing in mind the various manifestations of venereal disease during the inspection of troops. Among the more common errors is the failure to consider the presence of a mixed infection in suppurating inguinal buboes that show a disposition to become indolent and that do not yield to the ordinary medical and surgical measures. By far the larger majority of men give a history and show evidences of treatment. In some instances regimental surgeons have followed their men through the examining board, offering the explanation that such-and-such a condition was considered innocent. If there is any line of disease the army medical officer should take pride in knowing and diagnosing, it is that of venereal origin.

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In civil life, the practitioner may excuse himself upon the ground of lack of familiarity or of dislike for this type of practice, but it is hoped that the excellent opportunities afforded by the service for this study will instil a disposition for keener appreciation of the study and care of venereal diseases in civil life. This laxity is displayed in the repeated attempts of the civilian practitioner to treat enlisted men for these maladies. Circumcision in the presence of open lesions, cauterization without first definitely determing the true pathology, administration of arsenicals sans pathology, sans conscience, all bear witness of that type of civilian practitioner who labors only with the hope of disposing of an open lesion or milking a soldier out of a fee. Not only should the soldier be held accountable for his attempts to secure such service, but the practitioner as well should be made to answer for the kind of medical or surgical aid given.

Our Federal Health Bureau has done much toward enlightening the public regarding venereal diseases and their consequences, and it falls to the medical profession, in and out of the service, to support these efforts by more than a passing interest. That can best be done by a thorough knowledge and appreciation of venereal pathology and its manifold manifestations and also by adhering to the most approved methods of handling venereal diseases as mapped out in the Venereal Service of the United States Army.

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THE MANAGEMENT OF HYSTERIA IN WAR

By TOM A. WILLIAMS, M.B., C.M.

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(With six illustrations).

FUNCTIONAL nervous disease is responsible for at least 10 per cent of the evacuations of soldiers during an attack. The vast majority of these men are found to have hysteria, and the greater proportion of them, if properly managed at once, can be returned to the firing line in a state of greater efficiency than before their sickness.

Those who do not have hysteria are for the most part in a state of high emotivity, termed anxiety neurosis on the records of the A. E. F. However, the majority of anxiety cases do not arise during battle. That condition is usually of slow onset and occurs after long-continued duty, as has been shown in the French army.

A small proportion of the men evacuated during battle will be found to have cerebral commotion, true shell-shock. This is characterized by: (1) The history of long-continued coma followed by torpidity and inertia. (2) A period of obnubilation and confusion often accompanied by hallucinations, delusions and erratic behavior. (3) Modification of the reflexes; the cutaneous reflexes may be absent and the plantar reflex in extension; the tendon reflexes may be exaggerated, diminished or a symmetrical at different periods; the pupils are usually widely dilated, although they react except during the initial coma. (4) Vasomotor disturbances, pallor, cyanosis, hypotension with asymmetry in different limbs. (5) Alterations in the cerebrospinal fluid, characterized by a disproportionate abundance of serum-globulin and albumen, with a relatively small increase of cellular elements unless hemorrhage has also occurred; in hypertension of the fluid, usually quite marked in the earlier stages, nearly always over 40 mm. and often over 100. (6) Labyrinthine disturbances revealed by reaction to galvanism, rotation and douching tests. (7) Distinct amnesia is usually present, even after the confused state ceases. It is, however, an error to believe that the recollections which disappear are the more recent. In many cases the memories lost are those of childhood, while those of the war persist. The law of Ribot does not hold.

The symptoms of these patients are not removable by psychotherapy; but it must not be forgotten that the suggestibility of a man in this state is highly increased and many hysterical symptoms do show

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themselves in commotioned patients. The removal of these by psychotherapy is no proof that a man has not been commotioned. Thus in one case after forty-eight hours of coma there was contracture of the lower limbs and complete mutism, although the former was made to disappear in a few minutes by suggestion, and the patient walked. Now, although the mutism disappeared during a dream in the night, although a contracture of the upper limbs ensued after lumbar puncture, although a hysterical chorea developed a month later, and although this man was able to return to the front soon after, yet a diagnosis of hysteria, though manifest, was insufficient, for rachiocentesis proved that there had been a cerebral commotion, for the fluid was distinctly hemorrhagic.

Trauma, or diseases which interfere with the activity of the cerebrum, decidedly increase suggestibility. Again a stay in a hospital furnishes suggestions towards hysterical accidents. Hence, neither the presence nor the rapid cure of a hysterical accident excludes a diagnosis of commotion.

HYPER-EMOTIVE STATES WITH ANXIETY

Emotional patients are often mistakenly labeled hysterical. Their condition is really quite different. Such individuals are far from suggestible.[1] It is difficult to obtain access to them, so absorbed are they in struggling against their anxiety. They often show tachycardia, vasomotor disturbances, excessive sweating, nearly always insomnia often with nightmares, their appetite is poor or they bolt their food, they are disinclined to smoke or do so feverishly and rapidly, and they are restless. These symptoms are aggravated by bombardment, by contrarieties. The patient rarely shows any focal symptoms such as paralysis, contracture, mutism, deafness, vomiting. True convulsive attacks do not even occur in these patients, although an emotional crisis might be mistaken for one by a careless observer. These patients are not amenable to suggestion, although they are amenable to a rational psychotherapy which penetrates the mechanism of their disturbance.

HYSTERIA IN THE WOUNDED

When there is a wound, and more especially one which has implicated a nerve, the attention of the clinician may be derailed from a psychogenetic interpretation of a case of war hysteria. This condition is very common, although it has been so frequently overlooked as to lead

[1] For the criteria of hysteria one should consult the various communications of Babinski since 1906, the discussion at the Paris neurological Society 1907–08 and my own publications on the subject since 1908. See index in Surgeon General's library. The differentia from emotivity are there clearly pointed out, as well as the principles of diagnosis from disturbances which are physical, neurotic, organic In my own writings the management of cases is presented also, see 1912 J. A. M. A.

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to the assertion that hysteria does not occur in the wounded. On the contrary, there have been thousands of wounded men in whom a hysterical syndrome has grafted itself upon the wounded part and has become so fixed as to require an intensive psychotherapy for its removal. The following examples and photographs illustrate this fact:

Case 1.—A soldier received a wound in the upper arm which had severed the musculo-spiral nerve. Suture was done. After the wound healed the man was sent back to his farm for a year with instructions to work. This he did, returning for inspection with a dropped wrist and unable to extend the fingers. Examination showed that all the extensor muscles responded both to faradism and to tapping. However, no voluntary movement whatever could be accomplished by the patient, so much so that the chief of the service believed that stretching of ligaments and tendons accounted in large part for the man's incapacity. I saw no evidence of this and immediatey began to reëducate the movement by persuasion, with the result that in less than five minutes complete extension of both wrist and fingers could be accomplished by the patient, who was not backward in showing his joy at his rapid recovery. The mechanism in this case was very simple; its foundation was the man's belief that, because the nerve which raised the hand and fingers had been cut, he thought it was impossible to make these movements. Accordingly he had never really tried. With regard to these movements he had therefore not exercised the dynamic volition which the psychotherapy compelled him to do.

Case 2.—In this case the mechanism was one of pure suggestion, as the wound which existed did not directly affect the extensors, for it was in the flexor region, as the accomoanying photograph clearly shows. (See Figs. 1 and 2.)

Case 3.—Still farther removed from the first mechanism is the next case, where the wound was in the metacarpus. It is possible that reflex inhibitions had been responsible in the first place for part of this patient's inability, but the complete immobility was psycho-genetic. (See Figs. 3 and 4.)

Case 4.—Similarly it is very doubtful that anything but a psychogenetic mechanism was responsible for the disability of the arm in this man, where there existed only a flesh wound of the shoulder. (See Figs. 5 and 6.)

These cases may instructively be compared with one of those reported in my paper on modern treatment of hysteria to the American Medical Association in 1912, where in spite of an atrophy of the hand produced by a hematomyelia,causing a great diminution of power, the patient was enabled to use the hand sufficiently to work as a mechanic after one period of reëducative persuasion.

The leading *differentia* are that in a nerve wound there is a disappearance or, at least, great diminution of reflexes. There is localized muscular hypotonia and atrophy, as against slight general diminution of volume of the limb, which may sometimes occur from disuse during a hysterical paralysis. The modification of the electrical reactions is always present when a motor nerve is wounded, although these are not noticeable until ten days after the accident. The localization of the symptoms to the territory of the peripheral nerve wounded, of course,

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cannot be reproduced by suggestion. If the symptoms extend beyond this territory—a frequent occurrence—the additional symptoms, not having the above-mentioned characters can be made to disappear by persuasion.

Reflex Paralysis.—However, a diminution of power in the movements of a limb may result exceptionally as a consequence of a wound which does not involve the nerves supplying the muscles concerned, and without the participation of a psychogenetic mechanism. This is believed to be in consequence of afferent impulses from a wound of another nerve or even of the connective tissues, in which afferent impulses determine reflexly an inhibition or excitation, more particularly of the vasomotor system. This usually leads to an inadequate blood supply of the muscles and poor nutrition, accompanied by chilling, which sign leads us to suspect this condition. Other symptoms are: alteration of tonus, alteration of reflectivity, especially hyper-reflectivity of reflexes and of muscles themselves to tapping, a slowing of the muscular contractions on electrical stimulation with anticipation of the tetanic curve, localized muscular atrophy not accompanied by reaction of degeneration, tremor on attempted use, diminution of the capillo-arteriole blood pressure, diminution of the oscillations of the arterial wall, cyanosis, osteoporosis, hyper-esthesia of the muscles and nerve trunks.[2]

The disturbances really present are usually enormously exaggerated by the suggestion brought by their presence. It is almost the rule to find the limb completely immobile and to be able to restore most of the movements by intensive psychotherapy. In some cases the morbid physical reactions gradually cease, but in others a tendency to rapid chilling of the limb and a diminution of dexterity has persisted for years.

PSEUDOPATHIAS

Hysterical Algia.—Still more difficult to correctly diagnose, and above all to treat, are those cases of trauma without external wound or visible bruise, but where the question is one of sprain of ligament or tendon. Even after the initial damage is healed the patient may continue to hold the part in an awkward attitude and complain of pain when any movement is attempted.

The same condition obtains even when there has been no trauma, but in cases which have originated from a local neuritis, myositis, or aponeurotic fibrositis, anthritis, teno-synovitis, resulting from chill, toxicosis, or perhaps from the assumption of a faulty attitude. Not only does the faulty position interfere with the function of the limb affected, but it disturbs the whole locomotory balance, as well as the

[2]See the book of Babinski & Froment, also a forthcoming article in American Archives of Neurology

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patient's mental attitude toward his functions. We know that as soon as a normal attitude is given to the part, the pain soon disappears. The problem then is to so influence the patient as to compel him to perform movements which restore the limb segments to their proper relation. This has to be done by the devices of psycho-therapeutic art. It is not necessary to conceal this in complicated mechanical apparatus, as more direct methods have proved the best. It is all dependent upon the skill of the therapeutist.[3]

An algia is merely a phobia against pain. The degree of the pain does not affect the question; what is important is the patient's mental attitude, for functions may be performed in spite of most intense pain, and where pain should be quite negligible it may lead to complete incapacity. The commonest of the algias during the war has been hysterical sciatica, but pseudo-lumbalgia and pseudo-gastralgia have also been common.

False Gastropathy.—But the suggestion which arouses the psychological symptoms may be derived not from injury, but from disease. Such cases have been quite common during the war. The most frequent, perhaps, are those where the digestion is concerned. The foundation has been a real break-down of the dealing with the food in consequence of fatigue, irregular and hurried eating, and the taking of excessive quantities in conjunction with severe exertion. A man who is hospitalized for this cause has his attention strongly directed to his stomach, more particularly when he falls into the hands of a certain type of gastro-enterologist. The massive and repeated suggestions derived from his treatment furnish the fulcrum with which he very easily constructs hysterical gastropathy.

In some cases the only symptom of this is persistent vomiting. In these cases however, there is little loss of appetite, and scarcely any falling off in weight, while pain is absent in many cases.

The *circulation* may be troubled by paroxysmal attacks of tachycardia. These are usually provoked by the arousal of emotions in the soldier, more particularly of those which have occasioned his removal from the line. The attack does not occur with the suddenness of a true paroxysmal tachycardia, there is not the sensation of cardiac shock, nor does the feeling of impending dissolution occur. The attack may last only a few minutes, but it may be several hours before the heart beat returns to normal, and it may last some days, although rarely. In some cases there are convulsive attacks in these patients.

These are not necessarily hysterical, however, but may be a direct

[3]See case 6, knee contracture, loc. cit., J. A. M. A., 1912.

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reaction of the distressing emotion which occasions the tachycardia.[4] They are, however, psycho-genetic in their manner of provocation.

The so-called *effort syndrome* is sometimes purely hysterical in mechanism. The patient believes that his heart is damaged, the least increase of demand upon it creates apprehension, the apprehension causes an emotional contraction both of heart and blood vessels, with an increase of rate, which being felt, adds to the apprehension and sometimes produces a rise of blood pressure which further increases the cardiac strain. The success of treatment is proportional to the access the physician gains to the initial cause, which is the patient's apprehension. The progressive exercises which have been utilized are perhaps merely efficacious in proportion to their suggestive influence upon the patients.

Tachypnea may be the principal manifestation. In these hysterical cases it is accompanied always by a general agitation excessive in degree, the patient complaining loudly, and marching up and down. There is no proportionate increase of pulse rate, but the patient seeks to remain in bed and begins to gasp upon the least movement. This is a frequent sequence to poisoning by gas, more especially of the irritating kind. It is sometimes difficult to differentiate the part played by respiratory damage from that of psycho-genetic order. Hysterical sequences are, however, common. These complications are very easily removed by appropriate psychotherapy.

Incontinence of urine has been not uncommon. It is either the relapse of a former adolescent incontinence or arises anew during warfare. It has often arisen in consequence of a mild cystitis or in consequence of prolonged fatigue. It is very easily removed by firm psychotherapeutic measures.

MANAGEMENT OF WAR HYSTERIA DEPENDS UPON A CORRECT INTERPRETATION OF ITS MECHANISM

The foregoing considerations will aid us to an understanding of the more simple mechanisms found in the hysteria of war. The case is less easy granting there has been no wound, and where injury has been internal, as in a post-commotional case. Where hysteria is expressed frankly as a psychological state the mechanism is apt to appear a little more complex.[5] However, as in the cases which have a physical expression it is merely a matter of a conditioning of the patient's reactions in conformity with the impression he has gained of the circumstance under which his disorder has arisen.

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[4] See my forthcoming book, "Neurological Disease of Warfare," in discussion of mechanism of these.

[5] See my detailed discussion—"Management of Besetting Fears, Phobias and Obsessions." Differentia of the curable from the obstinate type. *International Clinics*, 1919–20.

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It is purely a matter of comprehending his ideas and feelings. In modifying the patient's mental attitude, absolutely essential is it that the physician ascertain this attitude. To do so he must enter into the patient's own thoughts and feelings regarding his condition and that which has led to it. It is difficult for a soldier in the Army to show what he thinks and feels to the army surgeon, who is, of course, an officer. The man's confidence is inhibited by the disciplinary habits he has acquired in the Army. The medical officer who treats these patients must therefore remove, as far as possible, his cloak of office, and persuade the man to regard him for the time being as his personal physician only. When this is done the man can more readily reveal himself and show how he thinks and feels about his condition. The besetting fears which the patient has, the anxieties, the apprehension of difficulty, the feeling of unwillingness, the sentiment of loathing, the melancholic trends, will in this way all be unfolded to the physician who is willing to enter into the patient's thoughts, to understand and sympathize. It is all a question of motive and desire. The eugenist who excited so much commotion at the International Conference in London when he said that he would rather be the son of an efficient burglar than of an incompetent bishop had this principle in mind. The finding of effective motives and the helping of the patient to utilize them is the aim of the psychotherapeutist, and his success in doing so is the measure of his utility to the Army, and indeed to humanity.

It had better be clearly understood from the beginning that if the highly theoretical and often confused concepts regarding hysteria espoused by some neurologists are allowed to influence practice in the Army, there will be an enormous overcharging of the medical services with functional disturbances of this kind. For these concepts entail a consumption of time out of all proportion to what is at the disposal of the medical officer in time of war. Besides which, they are therapeutically incomparably less fruitful than the concept of hysteria which we owe to Babinski, which has enabled neurologists of France to cure generally, within a few days, at least 70 per cent of the hystericals from the front, and now enables those neurologists operating in the army zone to send back to the front almost 100 per cent of the functional disturbances of this nature. Even the most prejudiced will be compelled by the fact of this war to now acknowledge the utility, even if they do not care to face the truth, of the interpretation which traces the induction of hysterical symptoms to suggestion and which demonstrates that the so-called traumatic neurosis differs in no way from pithiatism.[6]

[6] See *American Journal of Medical Science*, 1915, and *Journal Criminal Law*, 1916, for clear discussion of traumatic neurosis.

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REACTIONAL TYPES

Patients suffering from psychogenetic troubles may be divided, from a therapeutic aspect, into two types of weighty practical import. They may be called the active, positive hostile type, and the passive, negative inert type. Obstinacy, however, is not a prerogative of the first type, for the inert patient may be exceedingly obstinate even though not actively resistant.

1. The men of the first type are determined to retain their symptoms. They have found their disease a handy method of evading unpleasant duty, and they actively do everything possible to avoid the measures needed for their cure. In some cases they resort to tricks and dodges to deceive the doctors and attendants; in others they bring an active opposition to bear upon his efforts, and in the worst of all they consciously simulate or even openly rebel in order to avoid the issue which they know in their hearts will lead to the disappearance of their symptoms, in consequence of which they will have to return to the duty which they desire at all costs to avoid.

The only way in which they can be cured is by effecting a psychological change in them—the old biblical expression, "to be born again," expresses the end to be aimed at. The morbid desire of the man to remain a patient must be substituted by a new desire, an aspiration towards the life of duty. There are two ways of effecting this. One is by making the hospital and treatment uncomfortable or unpleasant, so that the man, finding that he is out of the frying pan into the fire, begins to change his view and decides to try to get well.

Even when he reaches this stage, however, it is not enough, for he is then only beginning what every pithiatic must go through, namely, the casting off of a morbid habit, whether it is the habit of a vicious attitude or the habit of a non-use. It must not be forgotten that in some instances there are physical consequences of vicious attitudes and these have to be treated. Often their treatment is exceedingly disagreeable, quite apart from the good-will of the patient.

2. The commoner type of patient exerts no active opposition to the treatment, but he is a man ruled by his automatism and finds it very difficult, or even impossible, to himself make the effort necessary to break the acquired habit. Whether it is one of omission or of morbid commission makes no difference in the principle required for its reëducation, for the patient has to be pushed by the doctor into doing that which he is unwilling to do for himself. Sometimes the motive required to rouse him is, as in the case of the first type, dread of the unpleasant. More frequently, however, the method of sidetracking and indirect suggestion is the most rapid and effective in those cases, for in this way

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the man falls quickly and almost unknowingly into another automatism, which a skillful doctor takes care is the natural automatism he formerly had.

As, however, influences against recovery are constantly being exercised against these patients, not only by their concealed motives against a return to duty but because of the hurtful insinuations on the part of comrades or relatives, or perhaps, worst of all, on account of a conventional opinion that a neurotic soldier is incapable of further duty, the method of therapeutics, which has as its principal weapon dislike of discomfort, inevitably produces discontent and even rebellion, latent if not overt. This inevitably leads eventually not only to many individual failures but even to a breakdown of the organization which relies upon this method as its sheet-anchor. Accordingly, instead of the motive of repulsion being used, it is infinitely better to employ that of attraction; the former is a derivative of the fear instinct, biologically a negative chemio-taxis; the latter is an integral element of the positive motive-power of existence.

In the process of the inculcation of motive, every teacher of the young since Froebel has learned how vastly superior to the method of intimidation is the method of provoking interest. Even the method of repression is only of use as a means of breaking the chain of attention elsewhere than to the point desired. It is only when the subject becomes actively interested in what is being done that progress is made. So, in patients in whom psychological trends are the root of their disorder the dragooning is only the first step. We are back to the old saying, "The fear of the Lord is the beginning of wisdom." Some people forget that it should not be made the end. Hence, in the case of a pithiatic, he cannot be considered as safely restored until an active motive of desire to return to duty is substituted for his motive of desire to avoid discomfort. In some cases this is merely a flabby acquiescence in a general atmosphere. Such men are always liable to mental contagion, and their future, as their past, is dependent upon their environment. However, even in men of this kind, a course of training can endow them with an astonishing obstinacy in well-doing. Most *a propos* is the profound wisdom uttered by Jeremy Taylor when he saw the criminal led to the scaffold: "There, but for the grace of God, goes Jeremy Taylor." In the situation we are considering the grace of God is represented by the motivation derived by the patient from a skillfully devised environment. Those who have dealt with markedly hysterical cases know how faithful these patients become to a service which they may adopt. This is in virtue of their very defect, namely, the accentuation of their automatism, so that patients of poor judgment

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and highly suggestible may be moulded into very useful members of their group, provided they are not asked to step out of their regular groove. Even men who are intellectually quite low in type may be converted into valuable soldiers if this principle is utilized.

In persons of greater intellectual complexity, and particularly where the affectivity requires management, the appeal will have to be less simple, and the patient's own mental resources must be more largely deployed. To do this the physician must have a more extensive knowledge of the patient's personality than in the former cases. This is particularly true in the case of the actively resistant type of pithiatic. We have the right to believe there is a key to every one's heart. It is the psychotherapeutist's business to find it, and, when he does find it, to tax his ingenuity to open the door of an active and useful life to his patient. These men are worth saving, for the very qualities which enable them to resist actively will be of the greatest value to them as combatants.

Personality study is mainly necessary when there has occurred considerable fixation of the patient's hysterical ideas. In the earlier stages their expression is already frank, as in the not infrequent dumbfounded state in which men will often retire from bombardment. In this case an analysis of character is not necessary, for the man can be quickly shaken out of somnambulism and returned to duty. So apparent is this condition that the most important quality required by the doctor here is dynamic volition.

In the more subtle cases the doctor cannot successfully restore them unless he has an exact and clear knowledge of the psychopathical reaction common to these cases, and he also needs the power of penetrating into the patient's psyche. Then he is in a position to lead the patient out of the woods into the light.

An organization which effected this purpose with striking success was that in the 7th Region of the French army. It consisted of a central admission and reception center, where the patients were first examined, but where they also came in contact from the first with a number of soldiers who had been cured of obstinate and long-continued hysteria of physical allure, such as paralysis, contracture, camptorachia, stammering, tremor, etc.

Treatment, however, was not conducted in this center; but the patients, after a period of observation and infiltration by hopefulness, were removed to Salins. There, after another period of collective suggestion in the neighborhood of cured patients, treatment by the rapid method was attempted. It was nearly always successful at the first interview; but care is taken that the improvement obtained is then

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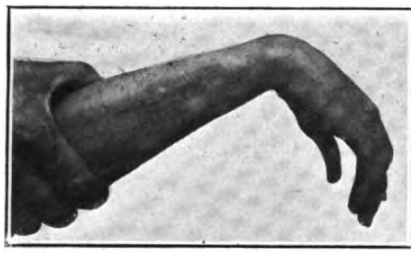

FIG. 1.
Hysterical drop wrist before treatment after *wound of ulnar region.*

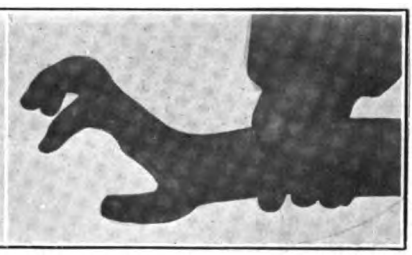

FIG. 2.
The result of rational persuasion.

FIG. 3.
Hysterical contracture of the hand before treatment after a *wound of the meta carpo—phalangeal region only.*

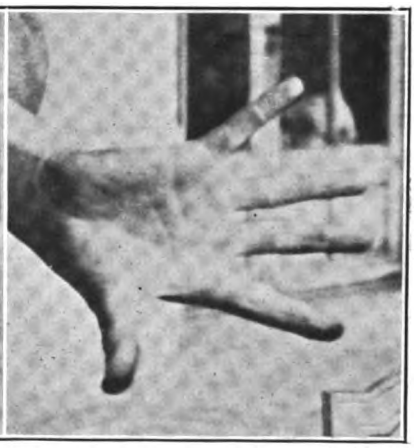

FIG. 4.
The result of rational persuasion.

(To face page 558)

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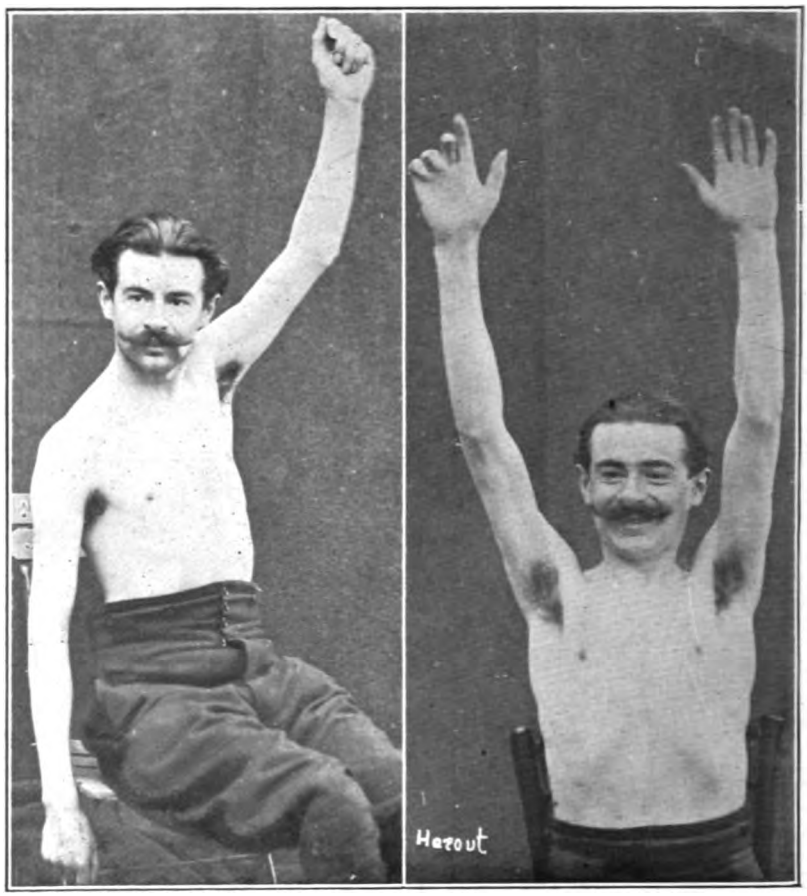

FIG. 5.
Complete right brachial mono-plegia after wound of scapular region.

FIG. 6.
The rapid result of rational persuasion.

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maintained by vigilant observation for two or three hours, together with almost continuous exercises during that period under supervision of the instructors who have been trained by the physician for this purpose. After some days or weeks of fixation of a cure, patients are then transferred to a training battalion under officers acquainted with the principles of the treatment and the object to be sought in the fixation of the results. The procedure is described in detail in my forthcoming book in which what occurs in the therapeutic interview is related word for word, and numerous examples are presented.

Relapses of cured hystericals will occur unless the men are imbued with intense military fervor, or those who are not capable of this are met on the lines of communication, at the depot, and in the regiment, by a firmness of dealing gained from instruction of the officers regarding the nature of the condition and the manner of its prevention in cured soldiers. This was accomplished eventually in most of the French army corps, but had not been organized in the A. E. F. when the armistice ended the fighting.

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DIAGNOSTIC SERUM FOR B. DIPHTHERIAE

By Major EDWARD H. MASON
Medical Corps, United States Army

DURING the past few weeks there has been conducted at this laboratory[1] a little investigation as regards the specific agglutinability of various strains of B. diphtheriae. This work was started because in a few of the hospitals of this base section certain of the laboratory officers were experiencing difficulty in deciding whether or not an organism was a true diphtheria bacillus, judging by morphology and staining characteristics alone. In consideration of this it seems to me that if a diagnostic serum developed in a rabbit would agglutinate all strains of true B. diphtheriae, and no strains of the pseudo or diphtheroid organisms, it would be of value when any doubt should arise as regards the true nature of a suspected culture.

To date we have been able to run these reactions in sixty-five strains of B. diphtheriae (determined by morphology and staining reactions), and ten cultures of diphtheroids.

The diagnostic serum used was developed in a rabbit, its titre being positive in 1–320. This was developed with strain No. 1. All cultures were isolated in pure culture by plating out the original throat culture on Loeffler's blood serum coagulated in Petri dishes. Agglutination reactions were run with fresh saline suspensions treated at 62° C. for 15 minutes, it being found that a lower temperature for that time would not kill the majority of the strains. After setting up, the reactions were run in a water bath at 56° C. for four hours, then kept in an ice-box over night, being read in the morning. Controls were run with normal rabbit's serum, dilution 1–20 and with saline. Virulence for a guinea-pig was determined with a limited number of the strains, it being impossible to determine it in all cases due to a shortage of animals. These tests were performed by the subcutaneous method. The results are seen in table on page 561.

In addition ten strains of organisms morphologically diphtheroids isolated from various sources, in no case gave any agglutination with the diagnostic serum prepared with strain No. 1 (B. diphtheriae). The controls in these cases were also negative.

From a consideration of the above results, it would appear that the use of a diagnostic serum in determining the true nature of a suspected diphtheria culture would be of value. In only one case out of the sixty-five strains examined did the organism fail to agglutinate, and

[1] Base Laboratory, Base Section No. 1, France, July 1, 1919.

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Strain	Source	Case or carrier	Virulence	Highest titre positive	Controls	
					Normal rab. 1-20	Saline
1	Camp Hosp. No. 11	Case	Vir.	1–320		
2	Camp Hosp. No. 11	Case		1–80		
3	Camp Hosp. No. 11	Case		1–80		
4	Camp Hosp. No. 85	Case		1–80		
5	Camp Hosp. No. 11	Case		1–80		
6	Camp Hosp. No. 11	Case		1–80		
7	Camp Hosp. No. 85	Case		1–160		
8	Camp Hosp. No. 11	Case		1–160		
9	Camp Hosp. No. 11	Case		1–160		
10	Camp Hosp. No. 11	Case		1–80		
11	Base Hosp. No. 101	Case		1–40		
12	Base Hosp. No. 101	Case				
13	Camp Hosp. No. 11	Case	Vir.	1–160		
14	Camp Hosp. No. 11	Case	Vir.	1–80		
15	Camp Hosp. No. 11	Case	Vir.	1–160		
16	Camp Hosp. No. 11	Case	A. Vir.	1–80		
17	Camp. Hosp No. 11	Case		1–80		
18	Camp Hosp. No. 11	Case		1–160		
19	Camp No. 3	Carrier	A. Vir.	1–80		
20	Camp Hosp. No. 11	Case	A. Vir.	1–80		
21	Camp Hosp. No. 11	Case		1–80		
22	Camp Hosp. No. 85	Case	Vir.	1–80		
23	Camp Hosp. No. 85	Carrier		1–160		
24	Camp Hosp. No. 85	Carrier		1–80		
25	Camp Hosp. No. 85	Carrier		1–80		
26	C. M. D. Lab.	?		1–320		
27	C. M. D. Lab.	?		1–160		
28	C. M. D. Lab.	?		1–160		
29	C. M. D. Lab.	?		1–160		
30	C. M. D. Lab.	?		1–80		
31	C. M. D. Lab.	?		1–320		
32	C. M. D. Lab.	?		1–80		
33	C. M. D. Lab.	?		1–160		
34	C. M. D. Lab.	?		1–40		
35	C. M. D. Lab.	?		1–320		
36	C. M. D. Lab.	?		1–80		
37	C. M. D. Lab.	?		1–160		
38	C. M. D. Lab.	?		1–160		
39	C. M. D. Lab.	?		1–40		
40	Central Lab. Savenay	Case		1–160		
41	Central Lab. Savenay	Case		1–40		
42	Central Lab. Savenay	Case		1–40		
43	Central Lab. Savenay	Case		1–320		
44	Central Lab. Savenay	Case		1–80		
45	Central Lab. Savenay	Case		1–40		
46	Central Lab. Savenay	Carrier		1–320		
47	Central Lab. Savenay	Case		1–320		
48	Central Lab. Savenay	Carrier		1–40		
49	Central Lab. Savenay	Carrier		1–160		
50	Central Lab. Savenay	Case		1–160		
51	Central Lab. Savenay	Case		1–160		
52	Central Lab. Savenay	Case		1–80		
53	Central Lab. Savenay	Carrier		1–80		
54	Central Lab. Savenay	Case		1–80		
55	Central Lab. Savenay	Case		1–160		
56	Camp No. 3	Carrier		1–80		
57	Camp No. 3	Carrier		1–40		
58	Camp No. 3	Carrier		1–40		
59	Camp No. 3	Carrier		1–160		
60	Camp No. 3	Carrier		1–160		
61	Camp Hosp. No. 85	Case		1–160		
62	Central Lab. Nantes	Carrier		1–160		
63	Camp Hosp. No. 11	Case		1–40		
64	Camp Hosp. No. 11	Case		1–160		
65	Camp Hosp. No. 11	Case		1–160		

none of the strains showed any agglutination in normal rabbit's serum in dilution of 1–20, or in saline.

Due to the closure of this laboratory it is impossible to carry this work further as was originally intended.

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A CENSUS OF SUSCEPTIBILITY TO MEASLES AND ITS RELATION TO QUARANTINE PROCEDURES[1]

By Major ANDREW WATSON SELLARDS
Medical Corps, United States Army

IN THE absence of specific prophylactic immunization for the control of measles one must resort to general measures such as isolation and quarantine. These procedures, while they are notoriously unsuccessful in civil life are rather more susceptible of application under military conditions. In a valuable paper, Munson[2] has reported the results obtained in the control of an outbreak of measles at Camp Wilson, San Antonio, Tex. Munson concludes that the disease can be brought under absolute control by the early isolation and segregation of contacts. At Camp Wilson a total of 444 cases of measles occurred among 13,773 troops, representing 23 organizations; with the careful application of preventive measures in 21 organizations, representing 11,362 officers and men, the incidence of the disease was restricted to a total of 105 cases; two regiments comprising 2,411 troops, in which the preventive measures were not fully carried out, developed 339 cases of measles. One of the prominent features of Munson's plan of prevention consists in obtaining a census of each regiment in regard to the susceptibility of the individual soldier to measles. Munson recognizes that such data represent only an approximation; however, he considers that they are sufficiently accurate for practical purposes and that the error lies largely in the direction of soldiers reporting a previous attack of measles when they really never had the disease.

The accuracy of a routine census concerning former attacks of measles among troops will be discussed in this communication. Occasion for obtaining this information developed in connection with work on inoculation of susceptible volunteers with the virus of measles. The statement of the individual soldier was obtained concerning measles, and confirmation was sought by communication with the individual's parents. The discrepancies were numerous and were almost entirely in the direction of soldiers having altogether forgotten definite attacks of measles in early life.

This report will be based upon inquiries made at the base hospital at Camp Meade, Maryland. In taking the census for a given disease, care must be taken to avoid prejudicing the men in any way, for the psychology of the average soldier readily becomes extremely active. For example, as pointed out by Munson, if it is suspected that sus-

[1] From the Base Hospital, Camp Meade, Md.

[2] Munson, E. L., Military Surgeon, 1917, vol. xl, p. 666; vol. xli, pp. 63, 186, 257.

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ceptible individuals may be quarantined and their liberties restricted, there will be a preponderance of immunes reported. In obtaining the statements of the soldiers at Camp Meade, each man was given a card to be filled out by the individual himself according to the following form.

SURVEY OF CONTAGIOUS DISEASES

Name..... (Last name) (First name and middle initial)

Present Assignment.....

Scarlet fever.....No	Doubtful	YES	At age of.....years
Measles.....No	Doubtful	YES	At age of.....years
German measles....No	Doubtful	YES	At age of.....years
Meningitis.....No	Doubtful	YES	At age of.....years

(Draw circle around correct answer)

On this card, several diseases were included for certain special purposes. For example, in the case of scarlet fever and measles it was desired to obtain immunes for the care of patients on the scarlet fever and measles wards. Incidentally, the listing of a number of infections would probably cause the soldier to consider his answer more carefully, avoiding in part merely perfunctory replies.

According to the replies which were received, one of the two following letters of inquiry was sent to the soldiers' parents:

U. S. ARMY BASE HOSPITAL

CAMP MEADE, MARYLAND.

Dear ————:

1. Your son is a member of this Base Hospital Detachment. He does not remember ever having had measles, scarlet fever or German measles.

2. It is important that you let us know immediately whether he has ever had any of these diseases.

3. After he was born, did any other members of the family have any of these diseases?

4. Please reply on back of this letter and send in enclosed envelope without postage.

Very truly yours,

(Signed) .....

U. S. ARMY BASE HOSPITAL

CAMP MEADE, MARYLAND.

Dear ————:

1. Your son is a member of this Base Hospital Detachment. It is important that you let us know immediately whether he has ever had measles, scarlet fever, or German measles. Your son is perfectly well, but this information is necessary for our statistics.

2. If he has had any of these diseases, please tell me whether other members of the family were sick at the same time.

3. Please reply on the back of this letter and send in the enclosed envelope without postage.

Very truly yours,

(Signed) .....

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The replies obtained, even from almost uneducated parents, were unusually clear and precise. In many instances they indicated beyond doubt that the individual in question had had measles. The following copies are characteristic of many of the answers received concerning men who reported confidently that they had never had measles in any form:

PHILADELPHIA, PA.,
2–10–19.

MAJOR A. W. SELLARDS.

Dear Sir: We received your letter in regards to my son John.

John and his bro. and two sisters had the measles at the same time. John was about eleven years old at the time.

Very truly,
(Signed).....

BALTIMORE, MD.,
Feb. 11, 1919.

MAJOR ANDREW W. SELLARDS,
Base Hospital, Camp Meade, Md.

DEAR SIR:

My son John had measles when very small and of course does not remember it, but never had German measles or scarlet fever. His younger brother and sister both had measles and scarlet fever.

Respectfully,
(Signed) .....

SIR:

Chas. had a case of measles when he was 2 years old.

(Signed) .....

The statements of the soldiers and the parents are presented in the following table. The men returning a reply of "doubtful" were too few in number to be of importance in this table.

CENSUS OF MEASLES

Statements of soldiers	Replies of parents.		
Number reporting measles	Reporting occurrence of measles	Reporting no attack of measles.	Indefinite or doubtful replies
144	133	9	2
Number reporting no attack of measles.			
89	49	22	18

From this outline it is seen that the vast majority of answers indicating a previous attack of measles were confirmed by the letters from the

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parents (92 per cent.) and that a very considerable proportion of answers (55 per cent) indicating no attack of measles were clearly discredited by the parents' statements. A precisely similar result was experienced in taking a census at Camp Devens, Massachusetts. A large number of doubtful replies (18) is listed concerning the men reporting no attack of measles. Sixteen of these represent conditions in which one or more members of the family developed measles and the individual in question, though at home during the period, is reported by the parents as having probably escaped infection; his susceptibility under such circumstances may very well be considered as questionable. There were nine men reporting a definite attack of measles which was not confirmed by the parents' statements; these replies were, in some instances, rather perfunctory. It would seem probable that these men had had measles; certainly the burden of proof would rest with one wishing to establish their susceptibility.

These results introduce an element of doubt into some of the conclusions drawn by Munson. Inasmuch as the number of measles cases developing at Camp Wilson was only one-fifth of the entire number reporting themselves as susceptible, Munson concluded that the preventive measures probably protected four-fifths of the supposedly susceptible men. Of the 89 men at Camp Meade reporting themselves as susceptible, the more reliable information obtained from the parents indicated susceptibility with reasonable certainty in only one-fourth of this number (22 instances).

Summary.—A census of susceptibles and immunes would be of distinct value in attempting to control measles by isolation and quarantine. The statement of the average adult that he has never had an attack of measles is thoroughly unreliable. There are many minor sources of error, but the discrepancy lies predominantly in the direction of immunes reporting themselves susceptible. The incidence of measles during infancy is extremely high; in adult life, the individual himself is unable to remember his infection.

Accurate data concerning the efficacy of quarantine measures in protecting non-immune individuals cannot be computed from the unconfirmed statements of adults reporting themselves susceptible to measles.

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EDITORIAL

HONOR AND DISHONOR

We reprint below an editorial from the *United Service Gazette*, issue of August 28. There seems to us to be in it much food for reflection. The analysis of the traits which underlie courage and cowardice is well defined and seems to us that which is generally accepted. A young Frenchman, Paul Lintier by name, analyzes the question of fear in a little book, "Ma Piece," which he wrote before he was killed in action against the Germans in 1916.

His deductions are quite apparently drawn from self-analysis, and his conclusions tally closely with those of the editor of the *United Service Gazette*.

The average man is not a coward, but innate courage must be fortified and accentuated by a certain continued association with the factors which as a whole make up the condition "danger."

The life of the soldier in campaign supplies this daily contact with death, and Lintier holds that the average man under such conditions becomes in a measure inured to the possibility of termination of life at almost any minute. He draws a parallel between the soldier's existence and that of the very old—each with the shadow of eternity ever hovering over him goes his way with the assured calm of the fatalist.

After all, the dividing line between bravery and cowardice is fear.

One fears either that he shall lose his life or that he shall lose his honor. These two influences determine for him into which category he shall fall, and so, in the manner of the Greek Sophist school, we may draw the final conclusion that Courage is really Fear.

W concur in the objection voiced by the editor of the *United Service Gazette* to extending punishment beyond the pale of life. After all there must be a measure of pity for the unstable soul which could not subordinate the terror of death to the fear of living shame. There must be some gear missing in the make-up of those who cannot stand fast, either afraid or unafraid to face the last reality.

And so, if through the judgment of their follow-men and in accordance with the uncompromising demands of war they finally face before a firing squad that which they once fled—"death by musketry"—they have paid their debt to society and the ultimate atonement has been rendered. Have we the right to follow them to the place where they must be judged by the Great Commander?

We think with the editor of the *United Service Gazette* that it were better to cancel the record rather than to perpetuate a disgrace to

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which they themselves are oblivious and which would serve only as an ever-present badge of shame to their surviving kin.

JAMES ROBB CHURCH.

AN UNFAIR AND NEEDLESS DISTINCTION

It is understood that a difference is to be made in the graves of men killed in action and of those shot after conviction by a court-martial on the charge of cowardice. Now assuredly a soldier can be guilty of no crime greater than that of misbehavior in the presence of the enemy. Yet as regards the marking of graves we agree with the protest of Col. Lambert Ward, D. S. O., M.P., and think that the distinction named should not be permitted. A very wide question is opened up, of course, by the consideration of this matter. There is no quality which man more greatly esteems than courage, and at all times much has been written on the subject. Aristotle, as far as we recollect, discourses on what he terms the five spurious forms of courage, such as the courage of ignorance or the courage of experience. These he distinguishes from natural courage or bravery. And as every man is not naturally brave, it may well be asked why soldiers so rarely seem to lack courage. It is the result of training and discipline. Every soldier was once a civilian, but he does not acquire natural courage, in which he previously was deficient, merely because he became entitled to wear military uniform. But adequate Army training does undeniably instil into him that readiness to render immediate obedience, that self-control, that devotion to duty, that *esprit de corps* which has so often spurred naturally timid men to perform the most heroic deeds. As a matter of fact the man who overcomes innate fearfulness and steadfastly carries out a perilous duty is really more worthy of admiration than the man who feels no fear.

In his "Riding Recollections," if we remember rightly, Whyte Melville devotes two chapters respectively to "Pluck" and "Nerve," and tells a story, which he acknowledges to be impossible, which bears on this point. During one of the actions, the story runs, of the Peninsular War, an insubordinate major observed that his colonel was growing exceedingly pale. "Why sir, I believe you're afraid," he exclaimed. "Yes sir; I am afraid," replied the colonel, "and if you were half as much afraid as I am, you'd have run away long ago." Surely the senior officer's conduct in remaining at his post was more admirable than many a desperate enterprise of a reckless "dare-devil." It is needless to say that we do not desire to make little of natural courage. On the contrary, we believe it justly to have been described as the greatest of all virtues because it makes all other virtues possible. But however severely we may condemn them it is impossible not to feel some pity for the unfortunate men who broke down under the strain of active service.

As Colonel Ward wrote, "Two men, we will say, are living in London. They are in similar circumstances, have more or less similar tastes, and have lived more or less similar lives since they were born. In an air raid both bolt like rabbits to the tube railway for safety. They are accounted wise for this and applauded by their female relations. Later, one is taken under the Conscription Act and put into the Army. His pal, who is the same age and of the same medical category, belongs to a badged trade and thus stays at home and still continues to bolt to the tube when the raiders come over, and is still accounted a prudent man. The other, after three months' training, is sent to France, despatched to the trenches soon after landing, has a bad time there, which culminates in a severe bombardment, compared with which the worst air raid at home is mere child's play, *and is expected to behave like a veteran.*"

Therein lies the whole crux of the matter. The veteran, the adequately trained

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man, can be relied upon. We have had proof that the inadequately trained man cannot always be trusted in an emergency. Indeed it is a just cause of pride in the manhood of the nation that in our hastily raised armies so many men pulled themselves together. It was simply marvelous. Imagine the case of these men. They are suddenly plunged into all the racking horrors of front-line warfare. Their minds are shaken. When they come out for rest they dream of these horrors. Before they have time to get over it up they go to the line again. They are shelled on the way up, probably. In the confusion one of them drops out and bolts to a trench or dug-out. His battalion moves on without him. Three or four days later, longer perhaps, he is found behind the lines and is immediately arrested. It is all terribly simple. A court-martial, and he is being tried for his life. "But," as Col. Lambert Ward emphasises, "the full injustice lies in the fact that, supposing the battalion he was with had a good reputation, the chances are that he would be released under the Suspension of Sentences Act. He would be allowed to rejoin and to wipe out the stain by subsequent good behavior in the front line again. His sentence, one of death perhaps, would then go by the board. But supposing the battalion he was with had been doing badly. Then the chances are that an example would be made of him and he would be shot one chill morning."

Colonel Ward explains that he does not complain of the harshness of military discipline. No one knows better than he does himself how essential the death sentence is in cases like these. As long as there is war, as long as this country fights in war, these terrible things must happen. There is only one way to run war, and that is ruthlessly. From the civilian point of view these things are unjust; but, then, all war is unjust. But, he adds, "the war is over now, is it not? Surely the past should be forgotten. We must not punish a man twice. We have punished his body. We must not punish those in whose memories he still lives. That is double punishment. Let him in his death be treated exactly as those who, perhaps, were only a little more fortunate than he was. Many, many men would rather have had ten years' penal servitude than be sent back to the front line. They only went because they had to. And further, let all trace of his shame be expunged from the books. Let all the records of it be destroyed by the War Office. It is only common fairness in a war such as this has been."

With this opinion we must express entire agreement. "Tout comprendre c'est tout pardonner" is a trite saying, but assuredly it is applicable in the present instance. It is a sad subject altogether. But again must we repeat that justice cannot demand that any stigma should be carried beyond the grave.

BUSINESS AS USUAL

We make the following explanation without comment.

Notice of expiration of subscription to THE MILITARY SURGEON and of dues is mailed on the 20th of the month preceding date of expiration. This gives at least a month for answer. One month after the first bill a second one is sent, and six months later a third. If there is no response to the first bill, the name is taken off the mailing list and carried as suspended. At the end of two years a delinquent is dropped as provided by the Constitution and By-Laws.

Our circulation is the paid circulation. Those who defer payment to the receipt of a second bill cut down the circulation for the month.

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Our advertising income is based on circulation. To cut the latter cuts the former. To send three bills costs three times as much as to send one, in addition to affecting the circulation as already stated. Our idea of a secretarial heaven is a place where everyone on receiving his first bill sits down and returns it with a check for continuance or with a resignation, and thus relieves us of an indefinite position like Mahomet's coffin.

Also, we not infrequently receive letters in answer to bills stating that the journal has not been received for—oh, years and years! Please miss it before the bill comes! We work hard to make it readable and we *want* you to get it from month to month. Besides, it takes only one two-cent stamp to send the fiercest kind of a kick. We know that. If you don't get your copy let us know and we will see that you do.

J. R. C.

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ASSOCIATION NOTES

The following named officers have been elected to active membership in The Association of Military Surgeons of the United States since the publication of our last list:

Medical Corps, U. S. Army

Lieut. Colonels

Harold Barclay
Oliver H. Campbell
Malvern Bryan Clopton
Arthur H. Cilley
George Draper
Edward Campbell Davis
Martin B. Tinker
William H. Walsh

Majors

Ansel Granville Cook
August Edward Gerhardt
John J. Broderick
Lawrence F. Boland
George Baskervill
James C. Greenway
Charles Warner Jones
Henry James
Jool S. Kelsey, Jr.
Lewis F. Mobley
Arthur T. Mann
Jackson C. Robertson
Roland E. Skeel
Frank Joseph Slader
John J. Sellwood
Joseph Walter Schirmer
Roscoe L. Sensenich
Charles F. Tenney
Hugh H. Trout
Everett L. Goar
William Wallace Gilbert
Walter J. Otis
William Alonzo Searl
Harry Searls Gradle
David H. Lawrence
George Clifton Leachman
Henry Hymen Lissner

Captains

Larcus B. Allen
George L. Armitage

Captains—Continued

Edwin G. Adams
William J. Anderson
Clarence E. Boudreau
Walter August Burg
James Girard Blower
Richard Clarence Beebe
Sydney Elon Bateman
Samuel Woodman Bradstreet
George Washington Bowman
Osceola J. Brooks
Mortimer T. Cavanaugh
Russell J. Caton
John W. Cornell
Emile Lester Cottrell
William E. Chapman
Marshall B. Catlett
Elbert Learoy Damron
Herman A. Duemling
John H. Digges
Howland M. Flower
Charles C. Falk
Andrew Flanagan, Jr.
Charles Fidler
Samuel R. Guthrie
Cole Blease Gibson
Lyle B. Honeyford
Robert Roy Hoskins
Jacob A. Hartmann
Howard Roy Hess
Clifford John Huyck
Stephen B. Haessly
Samuel D. Ingham
John V. Johnson
Charles W. Jones
Oscar J. T. Johnston
Arthur Jordan
Frank J. V. Krebs
Warner M. Karshner
Charles M. Kent
Paul Leighton Leyda
Fred A. Lieuallen
Harry Stanley Lake
Henry Everett Monroe

Captains—Continued

Butler Metzger
George A. MacQueen
Francis K. MacMurrough
William D. McCalip
H. Charles Menzies
Wilbert Francis McNary
Thomas Reid McNab
Marion C. Palmer
Charles C. Rentfro
Jacob J. Ross
Wentzle Ruml
G. Hampton Richards
James Oscar Strickland
J. M. Scanland
William E. Sauer
Arthur Blair Shatto
Edgar E. Strickland
Wilfrid D. Sharp
Christopher C. Self
Joseph Schwarz
Paul H. Schaefer
Frank U. Swing
Harve M. Stricklen
Edward R. Schoolfield
Edmund B. Spaeth
William A. Thompson
James C. Tyvand
Gustave A. Thielke
Ralph K. Updegraff
Oscar H. Urstad
Edwin H. Wiley
Louis M. Weinfield
Frederick A. Wicker
Robert E. Windham
Frederick A. Webster
Arthur A. Whittemore
Oliver J. Westlake
William W. Harper
James E. Woelfle
James D. Weir
Michael G. Yeager
George Wesley Beatty
Frederic William Boyd

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Captains—Continued

Eli Euphratis Dotson
Frank Edward Dow
Lucien Clyde Fausold
George Washington Fithian
Lycurgus Martin Gurley
Charles E. Harris
Dixi George Hoyt
Guy McKevitt Johnson
Joseph E. J., King
William Henry Kingman
Leonce Joel Kosminsky
Robert Yearger Lacy
Abraham Leenhouts
John Timothy McGillicuddy
Benjamin D. Ruben
John H. Slevin
Edward C. Streeter
Dennis William Sullivan
Henry Hubbard Amsden
Charles Albert Ballard
John Loveless Beach
Ernst William Bertner
Edward L. Cooley
George T. Cott
John Smith Douglass
Charles Fama
Frank F. Finney
Sidney Dix Foster
George Edward Glover
Louis David Green
Joseph W. Johnson
Henry E. Keely
Theodore J. Kerr
John Albert Kimzey
Granville Ernest Leavitt
Kenneth A. J. Mackenzie
Roy J. Marshall
Robert C. McCreery
Keith Darwin Mills
Norman D. Murphy
Hugh Edward Prather
William Collins Pumpelly
Arthur Williams Ralls
Harry W. Werts

Lieutenants

Charles A. Allen
Charles Aronson
Emery G. Bounell
Hugh G. Beatty

Lieutenants—Continued

Melvin L. Battles
Ernest G. Bashor
Bernard McA. Bradford
John J. Bona
John I. Beattie
Francis S. Chambers
Rembert J. Coney
John S. Conroy
Henry N. Crandall
Festus M. Chaffee
Newton T. Clark
Benjamin L. Casey
Wm. Thomas Eudy
Clarence C. Elebash
Mortimer A. Ehrlich
Sigo Ehrlich
Wm. M. Empie
J. A. D. Engesather
Herbert W. Ellam
Allston L. Fogg
Leo Faske
Glenn T. Foust
David I. Frey
John M. Fewkes
Wm. J. Hultenschmidt
David Holden
James A. Hockaday
Adolph M. Hanson
Michele V. Iovine
John H. Johnson
Charles J. Jentgen
Verner Kennedy
Max Kummel
Charles R. Kerr
Jack R. Lavieri
Samuel E. Leard
Charles W. McLain
Robert G. Mossman
Walter D. Moccabee
Thomas D. Mills
Felix Murphy
Virgil O. Muench
Benj. N. Novy
James T. Nix
A. Null Osborne
Robert B. Oliver
Roy L. Pendergraft
Louis M. Pearlman
Frederick C. Potter

Lieutenants—Continued

James P. Roth
Clarence M. Reddig
Oscar J. Ruzicka
James G. Rea
Edward F. Slavik
William Daniel Schafer
Allen G. Sampson
Richard W. Sheely
Frederick S. Salisbury
James J. Shay
Howard H. Shiras
Leland A. Thompson
H. Roy Van Ness
Amos O. Waller
Calvin A. Walker
Frank D. Willis
Frank E. Weed
Herbert M. Webb
Alfred C. C. Wiebusch
Reginald G. M. Ehlers
Rollin S. Fillmore
William Marshall Gallaher
John L. Grant
Albert N. Mackey
Eugene G. Mattison
J. Jay McCarl
Charles McLaughlin
Charles McLaughlin
Kenneth Earl Montgomery
Butler H. Sanchez
Frank Waldo Scott
Lewis J. Siegal
John H. Baird
William R. Blackburn
Frank Robert Braden
Robert L. Cowen
Thomas Valliere Daganult
George E. Deering
Henry DeWitt Duryea
Sereno M. Ferguson
James Edward Grady
Henry Beenwkes Hess
Arthur J. Hewett
Clarence Bronson Kenney
George Ray Lyon
Guel George Morehouse
Theodore William Neumann
Frank Bartholomew Preskunigis.

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Lieutenants—Continued

Walter Eliott Simmans
Bret L. Vilna

Medical Reserve Corps, U. S. Army

Colonels

Raymond Peter Sullivan
Hugh H. Young
Eugene Lindsay Opie

Lieut. Colonels

Ewing W. Day
Blanton Hillsman
A. Parker Hitchens
Russell R. Jones
John L. Yates
Albert P. Francine
Frank Leech

Majors

Lloyd R. Allen
Henry Bierman
Russell R. Burt
Ernest R. Brooks
Charles C. Browning
Arthur B. Cullum
Stewart Cooper
Albert J. Caldwell
Thomas F. Davies
Homer Davis
Frederic G. Goodridge
Frank Y. Gilbert
Paul Stanley Hill
Paul R. McLaughlin
Roscoe T. Nichols
Axel W. Swenson
Frank N. Whittier
S. Marx White
Robert D. Campbell
John C. Dallenbach
James H. Finch
Marvin M. Head
Abram C. Legget
Ernest E. Nunnery
Frank A. Stockdale
Thompson W. Grace
LeRoy J. Holmburg
Louis A. King
Charles H. McBurney

Majors—Continued

L. W. Renfro
Robert Andrew Scott
Charles C. Wallingsford

Captains

William H. Brandt
Charles J. Barone
Alvin H. Carr
Hudson DeM. Fowler
Lorin L. Fowler
Robert S. Fletcher
Clyde D. Gulick
Charles J. Goeller
Charles A. Holbrook
John L. Ireland
John Daniel Kerr, Jr
Knute O. Knudson
Max Constant King
Robert M. Milner
Morris Maslon
Bayard T. Mousley
Frank Overton
John W. Sifton
John F. Schafmeister
William R. Simmons
Christian A. Senn
Theodore F. Seymour
Raymond G. Schutte
Joseph A. Silverman
Jackson Temple
Charles F. Thomas
Charles E. Verdier
John H. Woodruff
Victor B. Weller
Samuel H. Yokeley
Henry K. Yaggi

Lieutenants

Frederick G. Dutton
Frederick A. Johansen
Zachary A. Mollica
John H. Noah

Medical Corps, U. S. Navy

Commander

John M. Steele

Lieut. Commander

William H. Areson

Lieutenants

Kenneth Dartmouth Legge
George A. Hass
Maurice Joses
Deane R. Brengle
A. C. Smith

Medical Corps, U. S. N. R. F.

Lieut. Commander

John J. Collins

Passed Asst. Surgeon

Herbert A. Donnell
Jacob Probstein

Lieutenants

Charles F. M. Butterfield
Joseph V. F. Clay
Claude H. Castle
Walter L. Drewry
Herman G. Decker
Philip C. Douress
Harry M. Hendershott
Tolbert B. Hinson
Frederic V. Hussey
James H. Kerley
Harry S. Lewis
Charles F. Milligan
Alto F. Mahoney
Frederick R. Meeks
William W. McGehee
Charles B. Pritchett
Horace P. Stevens
F. Miller Trimner
George W. Williams
Edward R. Roberts
George W. Van Benschoten
William M. Fearon
Ralph Wm. Homer
Samuel S. Markell
Raymond Wm. McNealy
Joseph George Patiky
Ernest Ward

Medical Corps, N. Y. Natl. Guard

Captains

Albert B. Eckerson
J. Gardner Smith

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United States Public Health Service

Surgeons

Charles S. Brown
Alphonso J. McLaughlin

Assistant Surgeon

Joseph Edward Wheeler

P. A. Surgeon

David J. Jacobson

A. A. Surgeon

Stephen R. M. Kennedy

Associate Members

Dr. Ejnar Hoff
Thos. M. Haskins
Dr. Wm. Allen Griffith, Contract Surgeon, U. S. Army
Major G. W. Wallarich, S. C., U. S. Army

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COMMENT AND CRITICISM

MEDICAL ASPECT OF THE AMERICAN LEGION [1]

At the request of the Director of Publicity of the American Legion we publish the following.—THE EDITOR.

THE ONLY INTEREST IS THE WELFARE OF THE PATIENTS

In the history of all known wars until the nineteenth century, ten times as many died from disease as died from wounds. In the last century from five to two died from disease for every one killed in battle. In this war fewer died from disease than died in battle or from wounds; and if we except the respiratory diseases of influenza and pneumonia, less than one-third as many died of disease as of battle casualties. And as after the Spanish-American War scientific research and methods overcame typhoid, malaria and yellow fever, so we may confidently expect the next decade will overcome pneumonia, influenza, epidemic meningitis and possibly tuberculosis as well. In warfare of airplanes, gas and submarines, the medical personnel at sea or at certain posts with the expeditionary forces ran the same risks as the combatants plus the risks of contact with those infected by epidemic diseases. So who will say that the medical service has a less glorious record than any other branch of the military? No stigma is attached to the United States scientists for inhumane innovations like gas or poison-germ warfare.

For the future, diplomatic and political trends govern the line of study and work with the Medical Department as much as any other department, *e. g.*, if the next war will be in the adjacent tropics the country will need to build a fleet of shallow draft boats, also build land transportation that will not be stopped by sand and arid regions; similarly the medical officers must prepare to conquer tropical diseases and to save those sickened by conditions unique in the tropics. On the other hand, if the next war will be in the far east we shall need many large transports, a fast battle fleet, less subsistence if the Army lives in part on conquered territory, and the medical department must meet oriental diseases like the bubonic plague. Nowadays whole nations go to war, but unlike officers in other branches, such as infantry or artillery, the medical officers in peace or in war practice the same profession. For them there is no complete demobilization from the duty of watching and guarding the health and strength of the nation and its fighters, whether past or present or future fighters.

What shall be the attitude of the medical officers who are in the American Legion and who are not permanently in the Navy or Army?

[1] Read before the Oak Park Post No. 15, American Legion of Illinois, July 15, 1919, by H. S. Hulbert, M.D. (Ex-U. S. Navy).

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What shall be the attitude of the non-medical military men in the American Legion toward those who practice medicine? What shall be the attitude between the civilian doctors and the men who were in the armed forces? If these problems can be thoroughly studied and satisfactorily solved, the legionaires and the whole nation now and in the future will be benefited, and the interest, the experience and the good-will of the medical officers who served in this war, the doctors who stayed at home and the newly educated doctors graduating each year, will be available for the sick and convalescent in the Legion.

For over twenty years it was so often said of the G. A. R. and of the U. C. V.: "How quickly they are dying off!" Unless there is every step taken to prevent it, the same will be said of us, especially at first those who were gassed rapidly dying of tuberculosis. At the present time there are countless men in civil life who were in the service, who are far below par in health and comfort because of the hardships and conditions they met while in the service. The care for these men is our first duty and must be met at once. One may question, "Are not these men already cared for by existing organizations such as reconstruction hospitals, indemnities, insurance, etc.?" No, not entirely.

Treatment in hospitals and at military bases is a function of the Government, but walking cases who only need office or dispensary treatment in the vicinity of their homes while completing convalescence or while employed should not be sent to hospitals and need not be government patients. However, only the U. S. Public Health Service (U. S. P. H. S.) and military authorities should pass on questions of "in line of duty," of disabilities and of indemnities, and civilian physicians must be most careful to refer to the U. S. P. H. S. all such questions and not to express any opinion involving cause or monetary returns from the Government. We aim to relieve the federal officials of minor cases which can be the more conveniently and expeditiously handled by civilians, but we do not want to interfere with the legally prescribed decisions relative to indemnities nor with hospital care except when authorized to do so by the U. S. P. H. S. or by military authorities.

It has always been tacitly understood that the burden of care in the final stages of recovery must be borne by the families and civil communities. This phase of post-war work has not yet been systematized, and it is the purpose of this paper to plan and to initiate this decentralized organization through the American Legion. In both the Navy and the Army men were discharged from active duty if they were not sick enough to need hospital care, and those in hospitals not needed for further military duty were discharged from the service when symptomatically well enough to complete their convalescence at home.

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If a man now returned to civil life becomes incapacitated from causes incurred in "line of duty," he may get treatment from the government, through the War Risk Insurance work of the Public Health Service. But there are hosts whose conditions are too minor or not severe enough to warrant hospital care, or who are not legally disabilities incurred in the line of duty and therefore not suitable applicants for treatment by the Public Health Service, but whose health is such that they are not as well as they might be. Some of these are suffering from the prostration of influenza, others have stiffening joints from wounds, still others have battle dreams and insomnia, yet others are fatigued from the exhaustion of severe campaigning, etc.

Unable to hold down or to seek the jobs offered them, they are a burden to themselves and their families and friends. They discredit our employment bureaus; they contribute too little to the public welfare; they cannot seek to create and maintain happy families, and through neglect they tend to lose self-respect and initiative, thus deteriorating to bums and vagrants as has been the sequel to all other wars.

It is estimated that twenty-eight days of front-line work used up the average officer. There was wastage in men as in material, but the men must be salvaged, whereas wornout guns may be scrapped. Most of the munitions of this war will not be fit for combat duty in the next war, but each man in this war will be worth one and one-half men of equal rank and station and duty in the next war (1939?) if he is now brought to the best possible mental and physical health and maintained at that level. The health of the members of the American Legion is of national importance now and will be of still greater importance in the future.

I therefore propose that the position of the medical officer be created in each temporary post of the American Legion and of each temporary state organization, and that these positions be made permanent at the Minneapolis convention in November, 1919. Doctors who served in the Navy or Army will undoubtedly be willing to treat the men of the Legion who are not in the best health possible, according to their line of practice or specialty. Doctors who did not serve in the Navy or Army will be willing as a sign of their patriotism to help the Legionaires recover as fully as possible from the effects of the war, if they are properly approached by the local posts. Dentists, pharmacists, the nursing staffs of institutions, and all others in work allied to medicine will nobly respond to offer their services if there is a well-organised popular demand and recognition for their services.

I suggest that to the post of the medical officer of the local, state and national bodies men be selected who are of broad vision, tact, aggres-

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siveness, executive ability, and of high professional standing. They may well be assisted by a medical committee. The medical officer and the medical committee will gather data and information about the sick in the past. It is not intended that they shall themselves treat these sick, but they should supervise and coördinate their care by those to whom the sick are properly referred for treatment. They will make arrangements with local and district physicians, surgeons, dentists, pharmacists, hospitals, out-patient departments, clinics, societies, etc., for care and supplies, in return for public recognition of the services; free or at cost if the soldier cannot pay.

Assuming that there will be a veterans' organization in every community, large and small, for the call for volunteers and the draft reaching every community, the system of local care will be decentralized more than any government agency can decentralize or infiltrate. In the absence of red tape and correspondence the sick or wounded veterans will not hestitate about applying to designated local ex-service physicians as to whom they should go to receive the best available treatment, and "home-town" pride will diminish grumbling. If the way to get treatment is made prompt and easy and if the initiative rests on the soldier and his family, then the fear of further separation from home and the tendency to neglect the important last steps of treatment will diminish and coöperation and a spirit of optimism in eventual cure will be enhanced.

CONCLUSIONS

1. The advice and help of the medical branch of the military service deserve respect because it has increased the combat strength of armies tenfold.

2. Military medicine will change to prepare for the next war according to the trend of national policies and interests.

3. The American Legion must interest itself in the return to full health and effectiveness of its members, for their own and its sake, and for the safety of the nation at the next trial of military strength.

4. Present organizations such as reconstruction, war risk insurance, hospitals and insurance indemnities are not sufficient and should be reserved for serious cases, but need to be supplemented by doctors now in private practice, experts in every line, who are the best in each community, and civil practitioners, who should receive public recognition for their services.

5. Each post, each state organization, and the national body of the American Legion must have among its duly constituted officers and committees a medical officer and a medical committee to arrange for treatment of the Legionaires not still under government care whose

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health is in any way impaired by the war and who may be brought nearer to perfect health.

6. Those soldiers who are unable to pay should get treatment free or at cost, care being taken not to pauperize ex-soldiers on the one hand nor to overtax the medical profession on the other.

IMPORTANT PRECAUTIONS IN ADMINISTERING ARSPHENAMINE AND NEOARSPHENAMINE[1]

Experience has shown that the untoward results occasionally associated with the administration of arsphenamine are due in a large measure to the use of too highly concentrated solutions of the drug, to too rapid administration, and to insufficient care in rendering the solution slightly alkaline.

The reader, therefore, may be interested in studying the following instructions just issued to medical officers of the Public Health Service regarding the administration of arsephenamine and neoarsphenamine. Careful observance of the precautions here described will reduce the number of reactions from the use of these drugs.

GENERAL DIRECTIONS

The ampule, before opening, should be immersed in 95 per cent alcohol for 15 minutes in order to detect any crack or aperture not primarily recognizable. (Should such a breach be discovered, the contents of the ampule should be discarded.)

Arsphenamine

1. *Solution.*—Cold, boiled, freshly distilled water should be used in all cases except in the case of "arsenobenzol" made by the Dermatological Research Laboratory, in which case hot water is required. No more solution should be prepared at one time than can be given in 30 minutes.

2. *Neutralization and alkalinization of the above solution.*—With a graduated pipettte or burette add 0.9 cc. of normal NaOH for each 0.1 gm. of the drug (*i.e.*, 5.4 c.c. for each 0.6 gm.). The alkali should be added all at once and should quickly convert the acid salt solution of arsphenamine into the alkaline salt solution, or the disodium of salt of the arsphenamine base. (The solution of arsenobenzol, which is hot, should be cooled before adding the alkali). This represents slightly more alkali than just enough to redissolve the precipitate formed by the addition of this reagent.

The alkali used should be standardized against normal acid. Normal NaOH is a 4 per cent solution of the c. p. product. However, if made on the basis of weight, it may be considerably less than this

[1] Reprint from the Public Health Reports, vol. 34, No. 21, May 23, 1919, pp. 1131 1133.

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strength, hence the necessity for titration. It could be made up in amount sufficient for a month's use if kept in a well-stoppered bottle and exposed to the air for only a few seconds at a time when using the solution. It should be kept in a bottle that has been used for NaOH solution for some time, so that all action it causes in the glass will have occurred. Where it is impossible to have this made up at the station, it will be furnished upon request from the Hygienic Laboratory. Should the NaOH solution become cloudy or contain a precipitate, it should be discarded.

3. *Concentration of the drug.*—It is desired to emphasize the fact that the concentration of the drug should not be greater than 0.1 gm. to 30 c.c. of final solution. The practice of using concentrated solution is not only in direct conflict with the instructions on the circular, but carries a distinct hazard to the patient.

4. *Method of injection.*—The gravity method only should be used. Where several patients are to be injected from the same solution, the container for the solution should be graduated. If not already graduated, this can be done in a few minutes by sticking on a strip of adhesive plaster and marking the graduations on this. A convenient way to do this is to have each mark represent 30 c.c., with a long mark for each 180 c.c.; then, if the volume is made up so that each 0.1 gm. of drug is contained in each 30 c.c., the doses can be given accurately. It is a great convenience to have a glass stopcock near the glass tubing, which serves as a window just above the needle in order to control the rate of injection. If no stopcocks are at hand, the rate can be controlled by the size of the needle and the height of the column of fluid. A No. 18 or 20 B. & S. gauge is the best sized needle.

5. *Rate of injection.*—Operators should pay particular attention to the rate of administration and in no case should it exceed 0.1 gm. of drug (30 c.c. of solution) in two minutes. This point is especially emphasized because it is believed that excessive rapidity of administration accounts for more unfavorable results in the use of arsphenamine than any other one thing.

Neoarsphenamine

The principal precautions to be observed in the administration of neoarsphenamine are:

1. Only a single ampule should be dissolved at a time. This drug must not be dissolved in bulk to be given to a series of patients.

2. Cold water only should be used.

3. The dilution should be not stronger than 0.1 gm. of the drug in 2 c.c. of freshly distilled water.

4. A very small needle should be used, and the time of injection of the dose should not be less than five minutes.

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SOUTHERN MEDICAL ASSOCIATION

Thirteenth Annual Meeting, Asheville, North Carolina, "Land of the Sky," November 10-13, 1919.

Monday, November 10: Section on Urology, Section on Pediatrics, National Malaria Committee (Conference on Malaria), Southern States Association of Railway Surgeons, Conference on Medical Education, Southern Gastro-Enterological Association, and at night a public meeting under the direction of the Section on Public Health.

Tuesday forenoon: The formal opening with the addresses of welcome, address of the president, Dr. Lewellys F. Barker, the Orations on Medicine, Surgery and Public Health, etc.

Tuesday afternoon, Wednesday and Thursday: Section on Medicine, Section on Public Health, Section on Surgery and Section on Eye, Ear, Nose and Throat. Also on these days the American Child Hygiene Association (formerly the American Association for the Study and Prevention of Infant Mortality).

Tuesday night: A big general meeting early in the evening followed by a reception to the president at the famous Battery Park Hotel.

Wednesday night: Another general meeting.

A great program, delightful entertainment, beautiful scenery, balmy climate, fine hotels and plenty, reduced rates on all railroads—everything just ideal for this meeting.

UNITED STATES CIVIL SERVICE COMMISSION, WASHINGTON, D. C.,
September 10, 1919.

THE EDITOR.

SIR: The commission requests that you assist it in filling a number of administrative positions under the recently created Interdepartmental Social Hygiene Board, by inserting the following in your journal as an item of news.

Your cooperation will be appreciated.

By direction of the commission:

Very respectfully,

MARTIN A. MORRISON,
President.

GOVERNMENT WANTS WORKERS IN VENEREAL DISEASE CAMPAIGN

The recently created Interdepartmental Social Hygiene Board of the United States Government is in need of a number of specially trained men and women to complete its organization. The United States Civil Service Commission has announced examinations for the following positions: Chief of division for scientific research, $3,500 to $4,500 a year; chief of division for educational research and

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development, $3,500 to $4,500 a year; educational assistant, $2,800 to $3,600 a year; chief of division of relations with states, $3,500 to $4,500 a year; chief of division of records, information and planning, $3,500 to $4,500 a year; supervising assistant and inspector, $2,800 to $3,600 a year; field agent, $1,800 to $3,000 a year. All positions are open to both men and women.

Applicants for these positions will not be given scholastic tests in an examination room but will be rated upon their education, experience, and writings. Published writings of which the applicant is the author will be submitted with the application. For most of the positions a thesis on one of a number of given subjects will be accepted in lieu of published writings. The receipt of applications will close on November 4. Detailed information and application blanks may be obtained from the United States Civil Service Commission, Washington. D. C., or from the secretary of the United States Civil Service Board at the post office or customhouse in any of 3,000 cities.

The law creating the Interdepartmental Social Hygiene Board provides for the coöperation of the War and Navy Departments and the Public Health Service of the Treasury Department for the prevention, control, and treatment of venereal diseases. The duties of the board as set forth in the act are: (1) To recommend rules and regulations for the expenditure of moneys allotted to states for the use of their respective boards or departments of health in the prevention, control, and treatment of venereal diseases; (2) to select universities, colleges, or other suitable institutions which shall receive allotments for scientific research for the purpose of discovering more effective medical measures for the prevention and treatment of venereal diseases; (3) to recommend such general measures as will promote correlation and efficiency in carrying out the purposes of the act; and (4) to direct the expenditure of certain moneys appropriated by the act.

A REPORT ON 351 HERNIOTOMY CASES [1]

The following 351 cases of hernia were operated upon at this hospital since March 1, 1919; practically all of these men were overseas, and the hernias either developed in the service or were aggravated by service:

Single indirect inguinal, 147; single direct inguinal, 34; bilateral indirect inguinal, 46; bilateral direct inguinal, 20; recurrent, 20; a total of 333 inguinal hernias.

There were also: Femorals, 11; epigastric, 5; incisional, 2.

Of the 239 indirect inguinal hernias, 199 were complete and 40 incomplete. Seven of the 40 incomplete hernias were single and the remainder associated with some type of hernia on the opposite side.

The following conditions were found associated with the cases operated: Hydrocele, 8; varicocele, 3; sac containing adherent omentum, 7; sac containing adherent bowel, 1; sac containing inflamed appendix (appendectomy), 1; sliding type, 3; undescended testicle, 1; bladder accompanying sac, 2; femoral with bladder accompanying sac, 1.

The following preparation was used:

[1] By Major Walter H. Vosburg, M. C., U. S. A. Report of hernia cases operated upon at Base Hospital, Camp Upton, New York, during the past six months.

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All patients were given an enema the morning of the operation but no cathartics unless there was much constipation, when castor oil was given the night before. The patient was shaved, the field of operation was scrubbed with soap and water the previous day, and instructions given to take a hot bath and scrub genitals thoroughly. No dressing was applied. On the table the field was washed with gasoline, dried, then with alcohol and dried; and following this a coat of tincture of iodine was applied. With this method of preparation there was an infection of 1¼ per cent or a total of five cases. All of them were superficial and did not interfere with good union. All were staphylococcus aureus type and occurred in double hernia cases where both sides were operated upon at the same sitting. In the first three there was no change of gloves or instruments for the second side. In the last two which occurred, however, they had been changed. Until the last infection took place, 3½ per cent iodine had been used on the skin, but since then the tincture has been substituted and no infections have occurred. This period includes about one-third of the cases operated.

Bassini technique was followed in 241 cases, Bassini with Bloodgood modification (transplantation of the rectus muscle) in 78, Ferguson in 2, Halstead in 1 and Wyllys-Andrews in 8. The femoral hernias were treated by the Bassini method (high ligation of sac and attachment by deep mattress sutures of the pectineal aponeurosis as high up as the pectineal eminence, to Poupart's ligament).

No. 00 plain catgut was used for ties and No. 1 chromic to suture the conjoined tendon to Poupart's ligament (usually three interrupted sutures, sometimes four) and for the external oblique fascia. Interrupted No. 00 chromic was used for the skin and superficial fascia. Every effort was made to avoid trauma and to limit the amount of catgut to be left in the wound, only sufficient being used to obtain and maintain proper apposition until union had taken place.

An unusual number of cases required catheterization at least once or twice following operation.

Sutures were removed on the seventh day. All patients were kept in bed for two weeks; those with recurrent hernias, or those in which the rectus had been transplanted, a few days longer.

As the patients were awaiting discharge from the service and anxious to get home, they were usually discharged from the hospital during the fourth week. Those to remain in the service were sent to the convalescent center during the fourth week and retained there about two weeks before being sent to duty.

There were two cases of hemorrhage in wounds following operation,

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both recurrent hernias. One occurred a few hours after operation and one five days after operation. Wounds were opened, bleeding point ligated and there was no further trouble. There were no other complications.

No recurrences have been reported, but of course it is too early to judge results. We are keeping a record of the cases operated with their home addresses and hope to report results in a year.

Practically all of the cases were operated upon by Maj. Walter H. Vosburg, Lieut. S. S. Friedman and Lieut. Robert S. Dinsmore.

STANDARDIZATION OF AMPUTATIONS

By Major THOMAS G. ORR
Medical Corps, United States Army

The more I see of amputations the more the need of their standardization has impressed me. For some years standardization of the treatment of fractures has been urged, and very properly so, because standardization of their treatment, in so far as is possible, will be a great help to the physician, especially to him who is not skilled in mechanical surgery and treats only an occasional fracture case.

It seems that amputations would be even more suitable for standardization than fractures because this field of surgery is much more limited and much less difficult.

The world war has stimulated new interest in amputations and the treatment of the amputated. Never before has the fitting of artificial limbs so much interested the medical profession. In doing an amputation the chief idea of the surgeon in the past has been to cure the patient of his ailment and obtain sound healing, with little regard for the later fitting of an artificial prosthesis. Surgeons who have taken part in the surgery of the war, especially those who have done reconstruction work, have, for the most part, had the importance of function and the return of the soldier to the life of a self-supporting citizen so firmly instilled into their minds that future amputations will be done by them, when possible, at the site best suited for artificial limb fitting.

Numerous articles have been written since the beginning of the war on the best locations for amputation from the fitting standpoint. While these points are very well established, they may require some changes in the near future due to the development of limb-making and fitting. The actual technique of amputation best suited for comfortable and efficient limb fitting has not been sufficiently emphasized. The best method of

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making flaps, treatment of nerves, bone and periosteum could, with the vast war material, be very accurately established in the next few years.

Some of us can now realize the trials that the artificial limb-maker has had in the past and the much greater trials of the patient with the poorly planned amputation. We can understand why there are patients who prefer a life on crutches to the inconvenience and discomfort of an artificial limb. Many patients could have been saved a life of dependency or partial dependency if the operating surgeon had been familiar with the orthopedic side of amputations. The proper methods of preparing stumps for limb fitting and the means to employ to prevent deformity after amputation should be familiar to every general surgeon. It should be the duty of every operator who does amputations to do them in such a way and in such a location that the patient's future comfort and earning capacity be maintained. It should be his further duty to impress the patient with the necessity of early limb fitting and treat him as any other patient requiring a brace or appliance. The patient should not be turned loose to be supplied with a limb without proper medical supervision.

Modern text-books do not sufficiently emphasize and explain the best methods and best locations for amputations. Old illustrations, which may be misleading to the student or physician, are passed on from year to year. The amputation from the standpoint of limb fitting should be given greater consideration.

These brief suggestions are made with a hope that some means will be soon devised by which every surgeon may have impressed upon him the best and accepted methods of doing amputations.

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BOOK REVIEWS

LA PROTHESE FONCTIONELLE DES BLESSES DE GUERRE, by Dr. Ducroquet, Orthopedic Surgeon to the Rothschild Hospital. With a preface by Prof. Aug. Broca. 233 pages with 218 original figures. Paris: Masson et Cie., 1919. Price, 5 fr.

This little book of 233 pages is divided into twelve chapters and illustrated by 218 drawings, all original and drawn under the direction of Dr. Ducroquet. The book is a valuable addition to the literature of functional prothesis.

The author first describes the different methods of fixation of apparatus to the lower and upper extremities, the axes and mechanisms of articulation.

The different kinds of appliances described are: First, those for immobilization, those for limited movement, those whose object is to permit the patient to move around without compromising the repair of lesions of the extremities, and apparatus for paralyses.

Numerous types of orthopedic shoes are described and illustrated.

After using many illustrations of the moving-picture type showing the normal movements of the extremities and of the body in locomotion, the author takes up the different ankyloses of the inferior extremities and the changes noticeable in locomotion. The tibio-tarsal joint is first discussed with its therapeutics, orthopedic and surgical; then the ankyloses and limited motions of the knee and the hip are described. This is followed by a discussion on fractures and pseudo-arthroses of the lower and upper extremities, with their orthopedic and operative treatment.

An interesting study of the different muscles which functionate in the movement of the extremities is given, and how to demonstrate the action of each.

The paralyses are well described and many types of mechanisms for their support are illustrated, as are also apparatus for contractures and muscular lesions.

JNO. E. SUMMERS.

THE PRINCIPLES OF NURSING, by Charlotte A. Brown, R.N., Superintendent of Nurses in the New England Hospital for Women and Children, etc., etc. Illustrated. Philadelphia and New York: Lea and Febiger, 1919. Price, $1.75.

The author has prepared a concise and understandable elementary text-book on the *principles of nursing*. It is practical in its method of instruction, the clinical features being emphasized throughout. It can be recommended as a desirable text-book for young nurses beginning their hospital training, or for anyone wishing to obtain a knowledge of the fundamentals of nursing.

FRANCIS M. MUNSON.

ULTRA-VIOLET RAYS IN MODERN DERMATOLOGY, by Ralph Bernstein, M.D.; Professor of Dermatology, Hahneman Medical College, Philadelphia, etc., etc.; Author of Elementary Dermatology, etc. Lancaster, Pa.: Achey and Gorrecht.

The author has given to the profession, in a practical way, the results of his clinical experience with the use of ultra-violet radiations in the treatment of the various skin diseases for which he has found the ultra-violet light a desirable agent. The subject is presented briefly and with clearness, and with no intention of going into histo-pathologic details. The book is printed in large type and is amply illustrated.

FRANCIS M. MUNSON.

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THE HATCHET OF THE UNITED STATES SHIP "GEORGE WASHINGTON," Compiled by Capt. Edwin T. Pollock, U. S. Navy, and Lieut (j.g.) Paul F. Bloomhardt, Chaplain Corps, U S. Navy, 1919, 300 pages, illustrated; track chart in colors; 2nd edition. The Navy Relief Society, Washington, D. C., and 280 Broadway, N. Y. Price, $2.00.

This volume, attractively gotten up and well printed, is a collection of the issues of this seagoing newspaper which received extensive notice during its life, and also has considerable interesting information which is published for the first time. It is interesting not only as a unique piece of work, but also in the way of reminiscence from the daily sidelight which it gives as to our progress in the affairs of the war. Captain Pollock, the able and enthusiastic managing editor, had the advantage, as his associates on the editorial staff, not only of those who made up the crew of the ship but also of those who were passengers on her. In this way he was able to impress into service some very able talent to supplement the efforts of the regular staff. There is much that is interesting and much that is amusing in the issues, and it is a book which it is not bad to have as a reminder that the Yankee nation, even in its most serious mood, never altogether loses sight of the lighter side of things. We call attention to the quotation: "The net proceeds from the sale of this book are to be used for the relief of widows and orphans of enlisted men of the Navy and are to be handled by the Navy Relief Society, Washington, D. C., from whom copies of the book can be obtained." It is therefore evident that the purchaser of a copy not only gets value received for his investment but is also helping along in a material way a work which must, without question, appeal to us all.

JAMES ROBB CHURCH.

GUNSHOT INJURIES TO THE BLOOD-VESSELS FOUNDED ON EXPERIENCE GAINED IN FRANCE DURING THE GREAT WAR, 1914–1918, by Sir George Makins, G.G., M.G., C.B., President, Royal College of England; Surgeon to St. Thomas Hospital; Honorary Major General and late Senior Consulting Surgeon to the Expeditionary Force in France. Bristol: John Wright & Sons, Ltd.; London: Simkin Marshall, Hamilton, Kent & Co., Ltd., 1919.

This interesting volume is an amplified and revised edition of several papers already written upon the war wounds of blood vessels by this eminent author of war surgery, while in a special section, there appears the material of the great war from which his views have been deduced.

As stated in the introduction, war wounds of the larger vascular trunks and their outcome have been of special interest in the treatment of gun injuries for all time. Our knowledge as to the general behavior exhibited by these lesions has undergone little material change. For instance, the features of blood-vessel wounds related to the tendency to spontaneous cessation of primary hemorrhage; the frequency with which these injuries are attended with secondary hemorrhages; and, finally, the frequent occurrence of the various forms of traumatic aneurysm remain very much the same.

In this war valuable data have been gained on the signs of injuries to arteries by examination of the peripheral and vasomotor nervous systems; by the value of auscultation, local and over the artery, and also of the precordial region, and, further of the actual mode of development of some of the arterial injuries. The effects of the obliteration of the main vessels upon the vitality of the parts supplied by peripheral branches has been again studied with profit. Some valuable data have been acquired on the exact cognizance of the nature of the primary anatomical lesions of the

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vessels, as well as the arrangement of the vessels in relation to the various forms of traumatic aneurysm.

The relative advantages of obliterating the main vessels by ligature, the simultaneous occlusion of the artery and vein, and the attempt to maintain their viability by suture have been carefully noted. In the last method military practice was much curtailed by the septic nature of the wounds concerned. For this reason primary or early suture that was looked forward to with so much promise in the earlier part of the war had to be abandoned for a considerable time pending improvements in the general treatment of war wounds.

The prevailing characteristic features of vessel wounds in this war have materially changed as compared to those noted in the Spanish-American, Anglo-Boer and Russo-Japanese wars. In the latter wars the armament was principally the hand rifle of the foot troops, the reduced caliber rifle employing a steel-clad bullet of 26-30 calibers. The velocity of this projectile was about three times that of the old infantry rifle bullet. Its transit through tissues was so rapid that the vessels had no time to be pushed aside. They either suffered contusion, partial division or complete division.

In the present war, as noted by the author, the employment of every ancient form of missile has materially modified the nature and severity of vascular lesions. The nature of the wounds to blood vessels was in part not unlike those of our civil war, when contusion and laceration of blood vessels were so frequent. This came from the use of shrapnel balls in the earlier part of the world war, and the later employment of high explosive shells and bombs. The shrapnel ball and shell fragments were animated by low velocity, hence the occurrence of contusion and laceration to vessel coats. The employment of vast numbers of machine guns, which used the armored rifle bullet with rather unstable velocity and frequency of ricochet in flight to disturb the angle of the bullet with its line of flight, made lodgement laceration and contusion of tissues generally much more frequent.

This valuable volume is accompanied by four colored plates and sixty illustrations which give varied pictures of blood-vessel lesions and their results.

Coming from the pen of an author whose writings have taken high rank in military surgery for more than a quarter of a century, we have no hesitation in citing this production as one of the most valuable contributions to our medical literature that has come out of the great world war.

LOUIS A. LA GARDE.

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INSTRUMENTS AND APPLIANCES

THE TRANSPORT SPLINTS OF THE AMERICAN EXPEDITIONARY FORCES

By Lieut. Col. ROBERT B. OSGOOD, M.C., U. S. A.

(With nine illustrations)

EARLY EXPERIENCE OF AMERICAN SURGEONS

CERTAIN officers of the Medical, Reserve Corps of the United States Army had been fortunate enough to have served with the French and English Medical Departments before the United States entered the war. Several of these officers were on the staffs of the first six base hospital units which went abroad in May, 1917, to take over certain British general hospitals situated in France. These general hospitals received wounded from British casualty clearing stations in the zone of the advance, or in times of push directly from the front lines before any definitive surgery had been done.

The previous experience of these officers was of great value to them in the treatment of the battle casualties and afforded them an unusual opportunity to compare the routine French and British treatment of the bone and joint lesions. These lesions comprised about 50 per cent of the casualties, and in both armies their importance was at once appreciated.

IMPORTANCE OF BONE AND JOINT LESIONS

This importance was due not only to the frequency of their occurrence, but also to the serious nature of the lesions. The immediate seriousness was due to the state of "shock" which was so commonly associated with injuries of the joints and the larger bones. This made early surgical interference hazardous. The future seriousness was due to the potentially crippling nature of these lesions because of frequent interference with joint motion and because of the common deformities of alignment. Unless successful early closure has been possible, the chronicity of these cases is striking. It is caused by infection, which is nearly always present, and by the subsequent osteomyelitis which nearly always ensues.

FRENCH SYSTEM

The French, early in the war, began to appreciate the necessity of giving these cases special attention and providing specially trained medical officers. Thus the eminent gynecologist, Gossett, became their eminent joint surgeon; Heitz Boyer, the eminent genitourinary surgeon, became their eminent fracture specialist; and Chutro, from

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the Argentines, developed the treatment of osteomyelitis to its highest point. There was no successful attempt, however, on the part of the French to standardize the special apparatus for the treatment of these bone and joint battle casualties, which resulted in uniform methods of transport. Various types were tried, and various opinions existed as to the value of these types. When once the cases arrived at the special hospitals, their care became consecutive and under the supervision of one man in control of a chain of hospitals and directing a special group of medical officers. The transport of the wounded from the battlefield to the evacuation hospitals continued to be in the hands of the stretcher-bearers and the regimental surgeons, and perhaps less uniformity in the methods of splinting obtained than experience has shown to be advisable. In the evacuation and base hospitals much individual ingenuity was exercised and important and efficient apparatuses were devised. But here again observation seemed to show no standard methods of treatment. We were informed by Miss Cassette, who was assigned by the French government to the task of devising specialized apparatus for the treatment of bone and joint and muscle lesions, that over 300 different types had been employed.

BRITISH SYSTEM

The British made a more determined attempt to standardize their methods of transport splinting. The Thomas leg splint and Murray's hinged modification of the Thomas arm splint grew to be very generally employed as time went on.

As late as the summer of 1917, however, the wounded were arriving at the British casualty clearing stations and were being transported thence to general hospitals in the advance zone in various types of immobilizing apparatus of more or less merit.

Until late in the war, no scheme of unified control of this splinting had been worked out, although its importance had been appreciated by Maj. Gen. Sir Robert Jones very early, and an earnest attempt had been made to bring it about.

STANDARDIZATION SUGGESTED, FOR A. E. F.

Consultation concerning these matters and experience in the treatment of the British wounded led to an attempt on the part of the American orthopedic surgeons serving with the British to standardize transport apparatus. The purposes of this standardization were to simplify the methods by selecting only the most efficient apparatus. If the choice lay between two types of equal efficiency, the type easiest to manufacture and transport was always selected.

After a study of the problem for several months, these surgeons became convinced that a solution could be reached by selecting seven

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types of simple splints. Drawings of these were made and submitted to the Chief Surgeon, A. E. F., in August, 1917. Almost at the same time, an offer was received by the Chief Surgeon from the French branch of the American Red Cross, to manufacture and supply all the splints necessary for the American Expeditionary Forces.

Our casualties were expected to begin in the late fall or early winter, and the necessity for speed was evident if we were to be prepared to treat the wounded efficiently and have sufficient time to train the large number of American surgeons who were coming over to serve and whose experience in the treatment of this class of casualties in civil life had been very small.

Immediately after these drawings were submitted to the Chief Surgeon, Order No. 73, A. E. F., was issued. The board was directed, as will be noted, to standardize the surgical dressings and appliances, as well as to standardize the splints. These surgical dressings were to include those for the front line work and the base hospitals. They were to be manufactured and furnished by the French Branch of the American Red Cross.

[*Extract*]

HEADQUARTERS AMERICAN EXPEDITIONARY FORCES

Special Orders No. 73. FRANCE, *August* 20, 1917.

. . . . .

17. A board of medical officers is hereby appointed to meet at these headquarters, at the call of the president thereof, for the purpose of investigating and reporting upon the advisability of standardizing certain appliances to be used by the Medical Department and upon completion of this duty will return to their proper stations. Detail for the board:

Lieut. Col. William L. Keller, M. C.
Maj. Robert B. Osgood, M. R. C.
Maj. Alexander Lambert, M. R. C.
Maj. Joseph A. Blake, M. R. C.
Capt. W. S. Baer, M. R. C.
Capt. Nathaniel Allison, M. R. C.
The board will be guided by instructions from the Chief Surgeon.
The travel directed is necessary in the military service.

. . . . .

BY COMMAND OF MAJOR GENERAL PERSHING.

Official:
BENJ. ALVORD,
Adjutant General.

JAMES G. HARBOARD,
Lieut. Colonel, General Staff,
Chief of Staff.

This board met in Paris, as directed, on August 28, 1917, and on September 9, 1917, two representatives of this board, with a fair copy and the original drawings of a proposed manual which the board had been ordered to prepare, reported to the Chief Surgeon, A. E. F., at Chaumont, where the Headquarters of the American Expeditionary Forces and the Medical Headquarters were located.

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The text and illustrations were reviewed by the Chief Surgeon and, with the incorporation of certain suggestions made by him, were approved.

They were then transmitted by him in person, accompanied by the two representatives of the board, to the Commander-in-Chief, A. E. F., on the same day. After a careful survey of the proposed manual the Commander-in-Chief gave his approval by signing the following letter:

HEADQUARTERS, AMERICAN EXPEDITIONARY FORCES
OFFICE OF THE CHIEF SURGEON

September 9, 1917.

From: Chief Surgeon,
To: Commander-in-Chief, A. E. F.
Subject: Report of a Board convened for the purpose of standardizing certain Medical Department supplies.

1. Inclosed herewith is the report of the Board convened by Paragraph 17, Special Orders, No. 73, Headquarters, A. E. F., France, August 20, 1917.

1 incl. (Signed) A. E. BRADLEY.

Approved:
JOHN J. PERSHING,
Major General.

The foreword of this manual will outline its purpose.

In accordance with Special Order No. 73, A. E. F., August 20, 1917, the Board of Medical Officers directed to investigate and report upon the advisability of standardizing certain appliances to be employed and issued by the Medical Department of the United States Army makes the following report:

This board met as directed, and in its report recommends that in addition to standardizing the manufacture of splints and appliances a manual describing their proper use be published and distributed to all United States Army medical officers at home and abroad.

Essentials for Standard Splints

The board was unanimous in its opinion that the splints and appliances officially adopted by the American Army should possess the following qualifications:

1. Efficiency and correct mechanical principles.

2. Simplicity of design and low cost of construction so that sufficient quantities may be always available.

3. Transportability, in order that an efficient splint may be applied at the front and remain *in situ* until the patient reaches the more or less permanent base hospital, and, if occasion demands or the surgeon elects, may even be expected to make possible an entirely satisfactory end result, without change of the type of splint.

The Medical Department has no desire to dictate the exact line of treatment which shall be employed in the base hospitals. It is the desire, on the contrary, to encourage ingenuity in devising better methods for the treatment of these bone and joint injuries, which comprise so large a proportion of the battle casualties. The board is convinced, however, after a careful review of existing methods in the armies of the Allies and enemies and a personal experience in the active treatment of these lesions in the present war, that the simple apparatus recommended may be employed with entire satisfaction as to the end results, and without any great degree of previous training.

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The board believes that with the three types of wire-ring traction and counter-pressure fixation splints embodying the Thomas principle, the Jones "Cock-up" "Crab" wrist splint, the long interrupted Liston splint with adjustable foot piece, an anterior thigh and leg splint, Hodgen type, the Cabot posterior wire splint, the wire-ladder splint material, light splint wood, and plaster of Paris bandages and Bradford frames, treatment of all bone and joint battle casualties may be efficiently carried out at the front, and, if necessary, in base hospitals.

Advantages of Standardization

Holding this belief, they have been influenced in thus restricting their recommendations to the above types of splints and splint material by a consideration of the following advantages which their universal use would secure:

1. Possibility of quick manufacture and ease of distribution, thereby making available large numbers of splints of unit construction.

2. The combination of traction and fixation in the same apparatus, thereby favoring the comfort of the patient and avoiding the necessity of accessory adjustment.

3. Universality of type and simplicity of mechanical principle, thereby insuring quick familiarity with their uses and efficient application by the surgeon.

The board believes that it is the first duty of all surgeons to become familiar by actual practice in applying the splints to living models, with the methods herein recommended, the mechanical principles underlying these methods—namely, fixation and traction—and the details of the apparatus advised.

Since the successful treatment of these injuries depends so much upon the absence or limitation of infection in these compound fractures, they have seen fit to discuss the primary dressings and the line of mechanical after-treatment found most constantly to favor the healing of wounds, the union of bones, and the restoration of function.

It will at once be obvious that this manual does not aim to be a complete treatise on the treatment of this class of lesions. Its purpose is to put into the hands of the military surgeon a practical, time-saving guide, in which the text has been made completely subservient to graphic illustration.

The board considers that the simplification of methods and apparatus is of supreme importance, not only in the immediate care of the wounded, but in diminishing the national burden of the cripple.

The board wishes to express its gratitude to Mrs. Cyrus W. Thomas for her voluntary and patriotic service in making the drawings for this manual, and to Mrs. Gertrude Austin for her most valuable cooperation in connection with the dressings and surgical supplies.

Approval having been gained, and permission to accept the offer of the French Branch of the American Red Cross to be responsible for the publication of the manual having been granted, one of the representatives of the board was delegated to proceed to the front line and observe the transport of the wounded, in order that the board might be fairly certain that its decisions were correct.

STANDARD SPLINTS AT THE FRONT

The Ypres sector, which was active at this time, was chosen, passes were obtained, and the conclusions of the board were verified. One

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of the members of the board had been ordered to England for service with the British under Maj. Gen. Sir Robert Jones. This member was entrusted by the Red Cross with the duty of having the manual published and an edition of 25,000 shipped to the American Medical Supply Depot at Cosne, France. The first copies of this manual were shipped to this Supply Depot in early November, 1917, and from this time on copies were available for free distribution to every medical officer in the American Expeditionary Forces. The book was issued as a regular army manual for the Medical Department of the United States Army Expeditionary Forces in a small waterproof, khaki-colored volume of 190 pages and index, size 6½ inches by 4½ inches and opening the long way. The text described the different splints with line-drawing inserts and enumerated the types of lesions for which the particular splint was to be employed. It also described the dressings. One special series of these dressings deserves mention—the red, white, and blue packets, wrapped after sterilization in stout brown paper and marked by a red, white or blue band. The whole packet was then immersed in liquid paraffine which rendered it almost entirely moisture proof.

The Red packet No. 1, for small wounds, contained the following supplies:

1. 2 unbleached muslin bandages 4 inches by 5 yards cut on the bias; 2 safety pins 1½ inches long are attached to each bandage.

2. A muslin bag, opening at one end containing the sterile dressings which comprise: (*a*) 1 toothpick swab wrapped in oiled paper to be used for applying alcohol or iodine. (*b*) 2 cotton tampons. (*c*) 4 gauze wipes, 4 inches by 4 inches (for cleansing the wound). (*d*) 1 absorbent pad, 4 inches by 6 inches, attached to a muslin bandage 2 inches by 7 feet long, for final application to the wound.

The white packet, No. 2, contains:

1. 2 unbleached muslin bandages, 5 inches by 5 yards, cut on the bias; 2 safety pins 1½ inches long are attached to each bandage.

2. A muslin bag, opening at one end containing the sterile dressings comprise: (*a*) 1 toothpick applicator wrapped in oiled paper to be used for applying alcohol or iodine. (*b*) 4 cotton tampons. (*c*) 4 gauze wipes, 4 inches by 4 inches. (*d*) 1 gauze wick, ½ inch by 8 inches. (*e*) 1 absorbent pad, 5 inches by 7 inches, attached to a muslin bandage 2 inches by 7 feet long, for final application to the wound.

The Blue packet, No. 3, contains:

1. Two unbleached muslin bandages, 6 inches by 5 yards, cut on the bias; two safety pins, 1½ inches long, are attached to each bandage.

2. A muslin bag opening at one end containing the sterile dressings comprise: (*a*) 1 toothpick applicator wrapped in oiled paper to be

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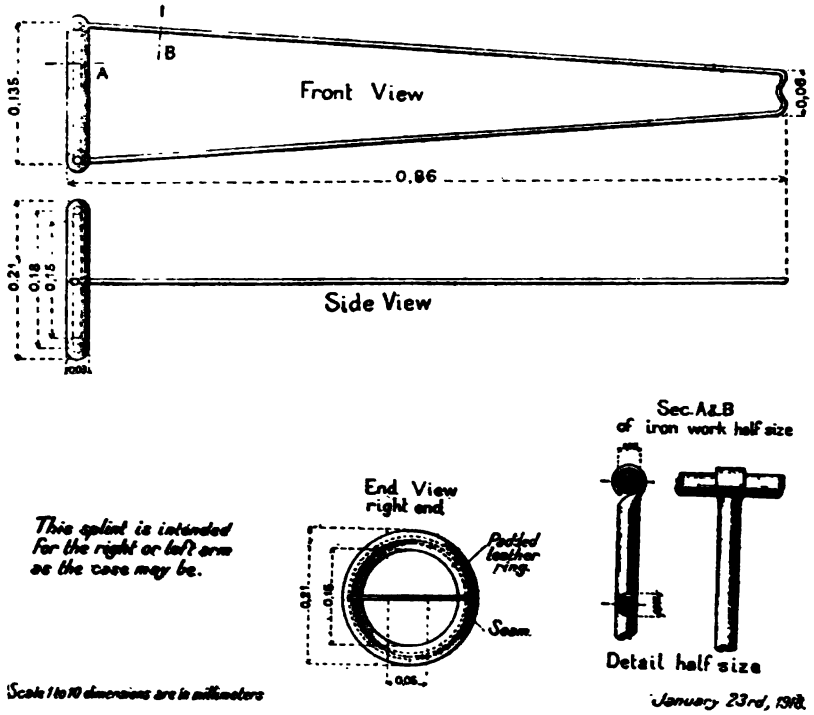
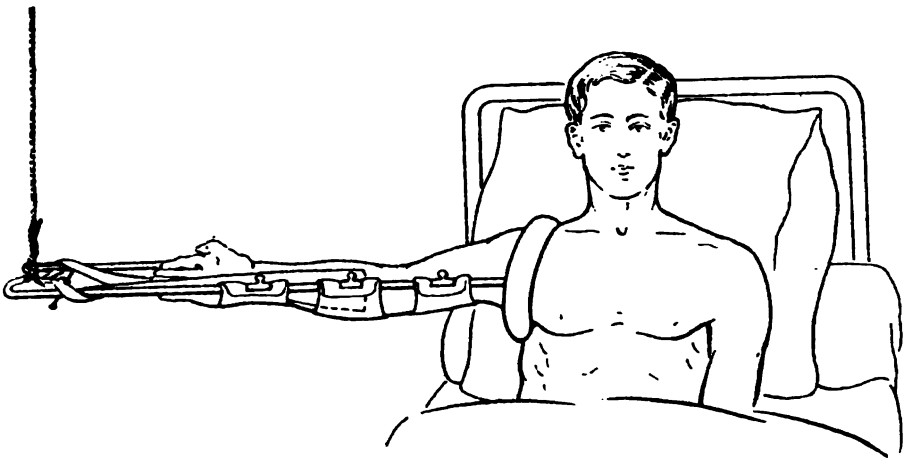


FIG. 1.—MECHANICAL DRAWING OF THOMAS TRACTION ARM SPLINT.
(For bed treatment chiefly.)

Uses.—(a) Injuries to the shoulder joint. (b) Injuries to the shaft of the humerus. (c) Injuries to the elbow joint. (d) Injuries to the forearm.



THOMAS TRACTION ARM SPLINT.
(Applied for bed treatment.)

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used for applying alcohol or iodine. (*b*) 6 cotton tampons. (*c*) 6 gauze wipes, 3 inches by 7 inches. (*d*) 2 gauze wicks, 1 inch by 15 inches. (*e*) 1 absorbent pad, 11 inches by 12 inches, attached to a muslin bandage, 4 inches by 7 feet long, for final application to the wound.

These proved of great value in the advanced zones and served their purpose admirably. They could be transported in open baskets without danger to their sterility from moisture.

Following the text of the manual were blank memoranda pages and, following these, line drawings and legends. The line drawings consisted of illustrations of the splint itself with the splint applied on the right-hand page and the legend in bold type on the left-hand page. The standard dressings and the various appliances recommended for base hospital use were also illustrated. More memoranda pages were inserted between the illustrations, and a full index. An elastic band retained the covers of the book, whose size was planned to fit into the side pocket of the regulation army tunic.

An attempt was made to furnish a practical working edition which could be used in poor light and which would stand hard usage. It seems to have fulfilled its purpose.

The second edition of this manual has been published in accordance with Special Orders No. 284, October 11, 1918. The medical officers serving on this board were: Brig. Gen. J. M. T. Finney, M. C.; Colonel William L. Keller, M. C.; Lieut. Col. Nathaniel Allison, M. C.; Lieut. Col. Joseph A. Blake, M. C.; Lieut. Col. Joel E. Goldthwait, M. C.; Lieut. Col. William S. Baer, M. C.; Maj. Sidney R. Burnap, M. C.

In this new edition, extra illustrations were inserted and detailed working drawings of the splints. An open abduction arm splint was added to the standard transport splints.

STANDARD TRANSPORT SPLINTS SELECTED

The seven transport splints illustrated were:

1. *The Thomas Arm Splint* and Murray's hinged modification of this, specially designed for transport in order that the arm might be approximated to the side and slung to a stretcher bar. The motion of the splint being centered to the same axis as that of the shoulder joint, slight movements of the limb did not cause any relaxation or tightening of the desired traction. (See Figs. 1 & 2.)

2. *The Jones Humerus Traction Splint* which was to be used in cases in which flexion of the elbow at right angles was desirable, and traction on the humeral shaft was necessary. (See Fig. 3.)

3. *The Thomas Traction Leg Splint* and the half ring modification of Colonel Keller and Colonel Blake. No splint used in the war has gained

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a larger number of enthusiastic supporters. It has received warmest commendation from all those surgeons who have seen it in action in the front, have learned the few essentials of its use and have had the opportunity of observing the cases as they came into the Casualty Clearing Station or the Evacuation Hospital with the splint properly applied. Fractures of the femur represent very serious casualties and

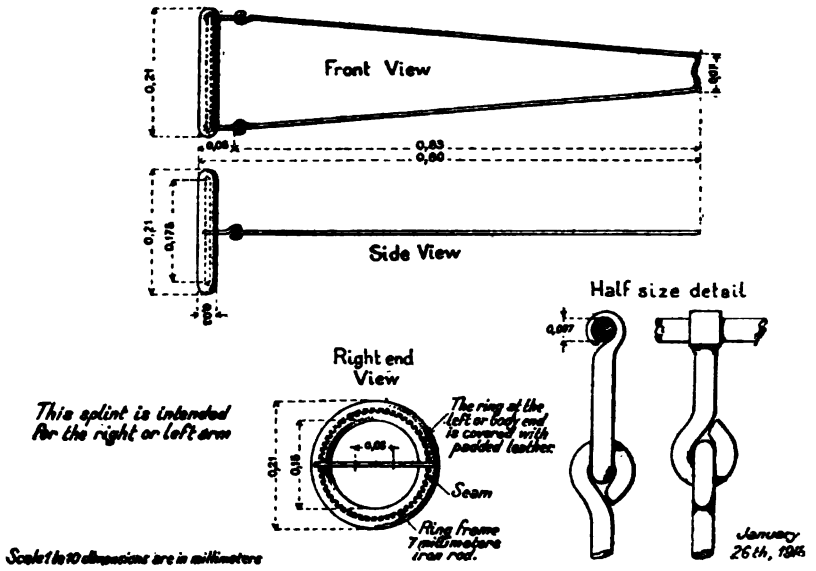
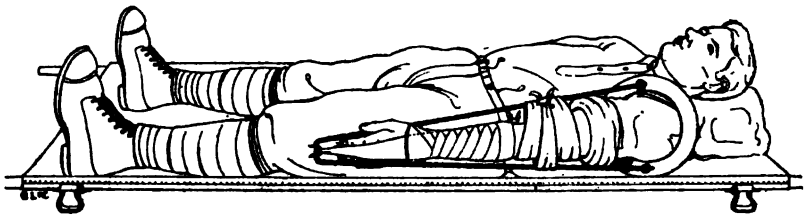

Front View
Side View
Half size detail
Right end View
This splint is intended for the right or left arm
The ring at the left or body end is covered with padded leather
Seam
Ring frame 7 millimetre iron rod.
January 26th, 1915
Scale 1 to 10 dimensions are in millimetres

FIG. 2.—MECHANICAL DRAWING OF HINGED TRACTION ARM SPLINT.

Uses.—(*a*) Injuries to shoulder joint. (*b*) Injuries to shaft of humerus. (*c*) Injuries to the elbow joint. (*d*) Injuries to the forearm. Should always be used as splint for transportation.



HINGED TRACTION ARM SPLINT.
(Applied for Transport.)

without proper splinting show a high mortality. The Thomas leg splint has greatly diminished this danger and lowered the mortality. One of Colonel Crile's axioms for the avoidance of shock reads, "Throw the Thomas splint as far forward as possible." (See Figs. 4 & 5.)

4. *The Long Liston Splint* with wire bridge interruption over the pelvis or the hip, and with a right angle foot-piece for adjusting the

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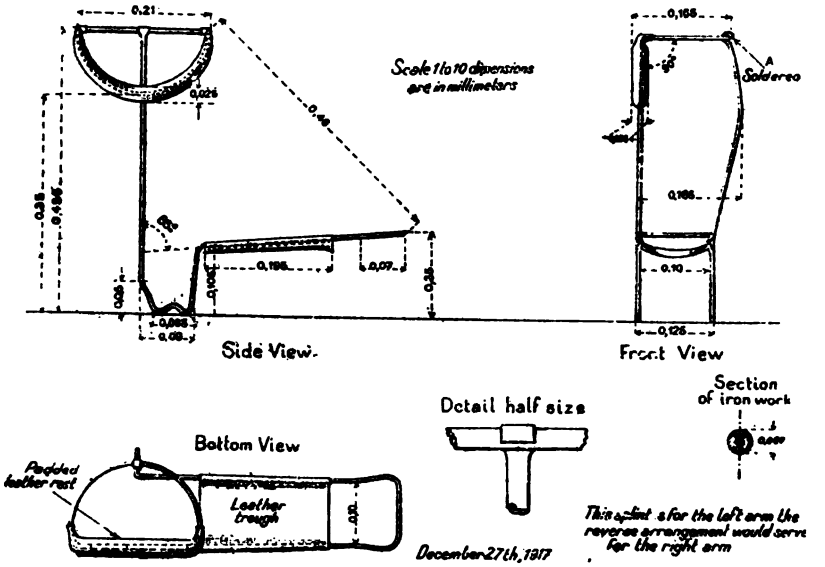
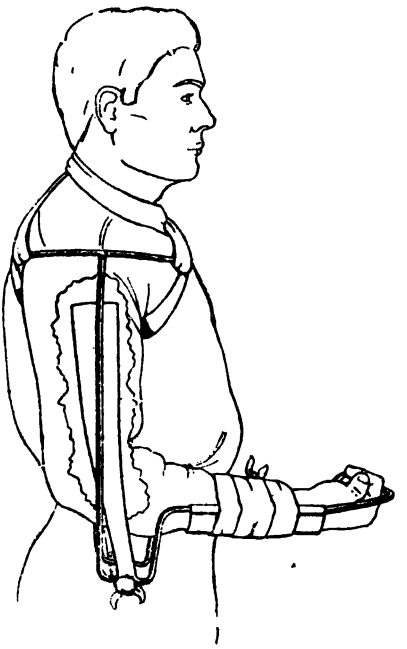

Scale 1 to 10 dimensions are in millimeters
Side View.
Front View
Detail half size
Section of iron work
Bottom View
Padded leather rest
Leather trough
December 27th, 1917
This splint is for the left arm the reverse arrangement would serve for the right arm

FIG. 3.—MECHANICAL DRAWING OF JONES HUMERUS TRACTION SPLINT.

Uses.—(*a*) Injuries to shaft of humerus in which traction on the humerus and flexion of the elbow joint are desired. (*b*) Injuries to the elbow joint in which flexion is desired. (*c*) Injuries to the forearm.



JONES HUMERUS TRACTION SPLINT APPLIED.

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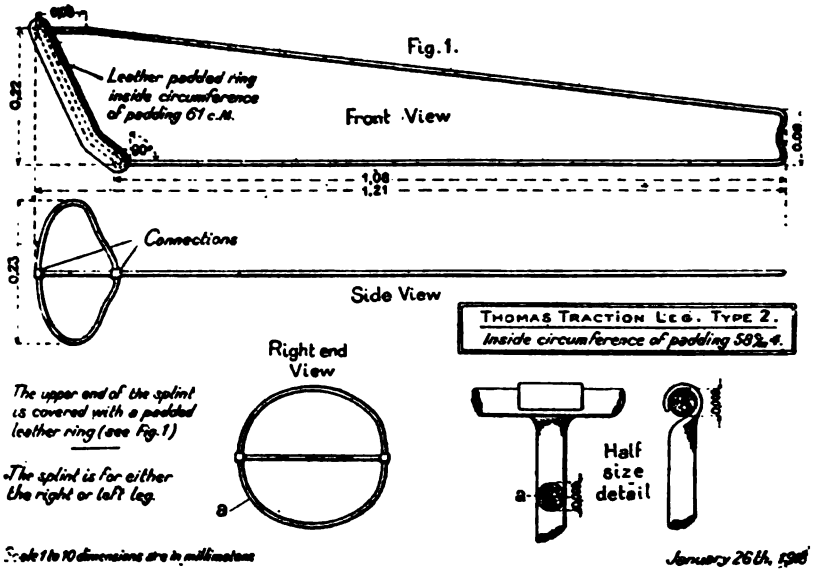
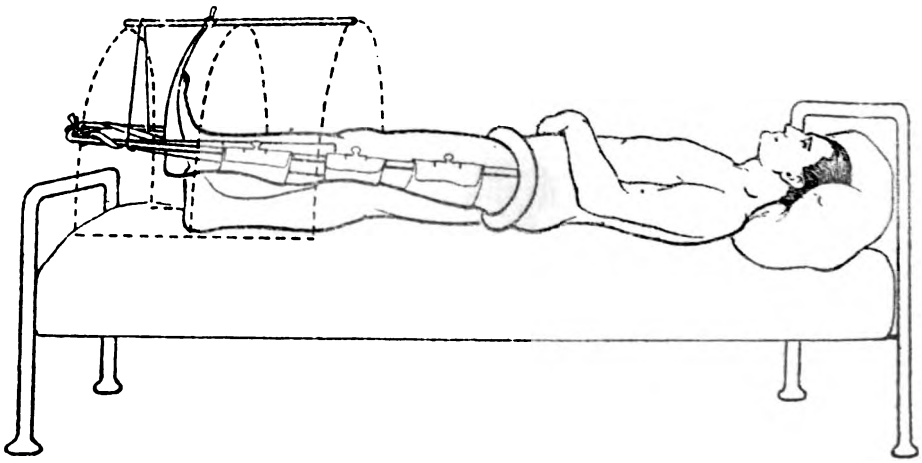


FIG. 4.—MECHANICAL DRAWING OF THOMAS TRACTION LEG SPLINT.

Uses.—(a) Injuries to the shaft of the femur. (b) Injuries to the knee joint. (c) Injuries to the leg.



THOMAS TRACTION LEG SPLINT APPLIED.

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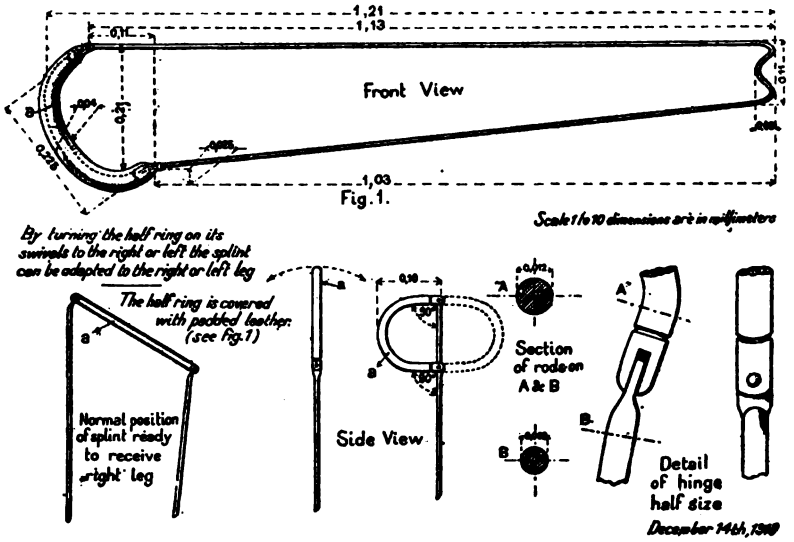
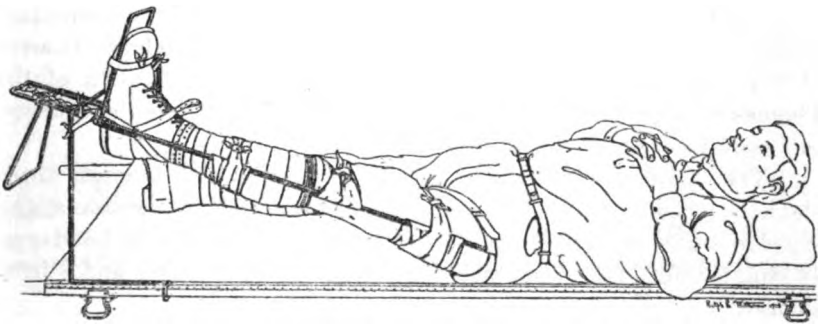

1,21
1,13
0,11
Front View
0,11
1,03
Fig. 1.
Scale 1 to 10 dimensions are in millimetres
By turning the half ring on its swivels to the right or left the splint can be adapted to the right or left leg
The half ring is covered with padded leather (see Fig. 1)
Normal position of splint ready to receive right leg
Side View
Section of rods on A & B
Detail of hinge half size
December 14th, 1909

FIG. 5.—MECHANICAL DRAWING OF HINGED HALF-RING THIGH AND LEG SPLINT.
(For transportation use.)

Uses.—(*a*) Injuries to the shaft of the femur. (*b*) Injuries to the knee joint. (*c*) Injuries to the leg.



HINGED HALF-RING THIGH AND LEG SPLINT APPLIED FOR TRANSPORT.

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length of the splint, was included for the treatment of the comparatively rare fractures of the neck of the femur in which the wound would be pressed upon by the ring of the Thomas splint, and also for fractures of the pelvis. This, and the Crab wrist "cock-up" splint of Jones (see 6), were the only departures from the otherwise universal selection of the wire splints. The long Liston splint was little used, but the board considered it the simplest and most efficient transport splint for these rather infrequent lesions. It served its purpose. (See Fig. 6.)

5. *The Cabot Posterior Wire Splint* was included as representing the best form of "ham" splint, retaining its position on the limb and maintaining the foot at a right angle with the leg. It was not employed for fractures except those of the ankle, but only for soft part wounds, contusions and simple joint injuries, always in combination with two side splints of the ladder splint material. (See Fig. 7.)

6. *The Jones "Crab" or "Cock-up" Splint*, designed to hold the wrist in dorsi-flexion and capable of being bent to any angle and acting as a simple immobilization splint. (See Fig. 8.)

7. *The Ladder Splint Material* was universally liked and proved most adaptable. It was furnished in 30-inch lengths and consisted of two lateral galvanized wires crossed every ¾ of an inch by a small 1-16-inch wire soldered to the side wires and bent into a slight concavity. It could be cut by pliers and made to serve as a hand, foot, forearm, or elbow splint where a mobilization only was needed. It was clean, light and compact. (See Fig. 9.)

SPLINT DRILLS

In all divisions the different drills in the application of these standard splints were given to the regimental surgeons and stretcher bearers by the orthopedic consultants. The drill for the application of the Thomas leg splint planned by the British, and adopted in our own army, will serve to illustrate these drills.

"The Thomas outfit" consists of a stretcher on trestles; three blankets; primus stove; Thomas splint (largest size); reversible stirup (Sinclair's); three flannel bandages (6 yards); four triangular bandages; dressings; safety pins; coaptation splinting (10 by 6 inches and 8 by 6 inches).

The personnel required consists of an operator, No. 1 assistant and No. 2 assistant (if available).

When not in use the splint is kept hung up. The five slings of flannel bandage are rolled round the inner bar of the splint, the leather is kept soft by saddle soap, and the iron bars are smeared with petrolatum.

The indications for front line application are:

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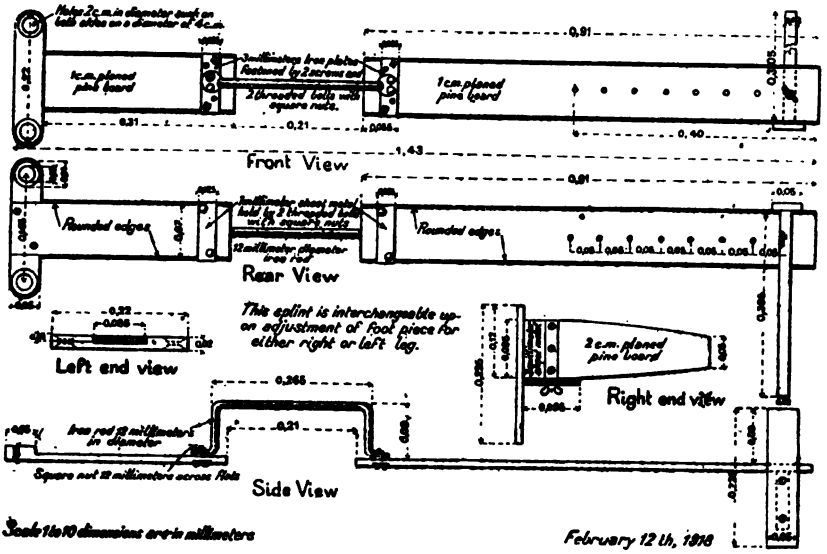
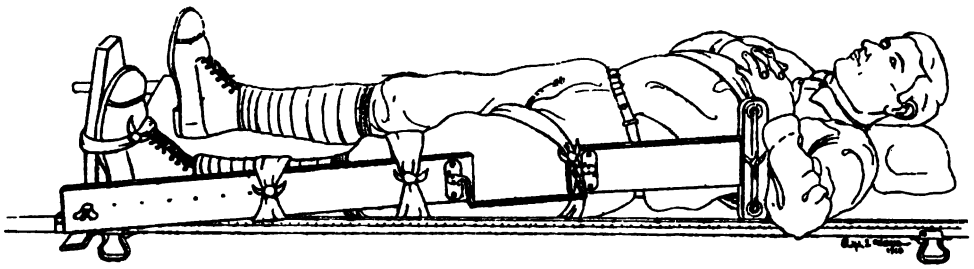

Front View
Rear View
Left end view
Right end view
Side View
This splint is interchangeable upon adjustment of foot piece for either right or left leg.
Rounded edges
1 cm. planed pine board
2 cm. planed pine board
February 12 th, 1918

FIG. 6.—MECHANICAL DRAWING OF LONG LISTON SPLINT WITH INTERRUPTING BRIDGE OF IRON WIRE.
Uses.—(a) Fractures of Pelvis. (*b*) Fractures of Hip Joint.



LONG LISTON SPLINT APPLIED FOR TRANSPORT.

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1. For all fractures of the thigh bone, except where there is an extensive wound in the upper part of the thigh or buttock which would interfere with the fitting of the ring.

2. In severe fractures of the knee joint or upper part of the tibia.

3. In certain cases of extensive wounds of the fleshy part of the thigh.

DETAILS OF THE THOMAS SPLINT DRILL

I. Warning (Rechauffment).—On the word "one," the stretcher, placed on trestles with a primus stove beneath, is prepared as follows: The first blanket is folded lengthwise into three; two folds lie on the stretcher, one hangs over the side. The second blanket is arranged in the same way, one fold hanging over the side of the stretcher.

The patient now is placed on the prepared stretcher and lies on four folds of the blanket; the two folds hanging down form a hot-air chamber. The third blanket is placed across the patient's chest while the splint is being applied.

II. Extension.—On the word "two" the No. 1 assistant stands at the foot of the stretcher facing the patient and opposite the injured limb. Grasping the heel of the boot with his right hand and the toe with his left, keeping the arms straight, he exerts a steady pull, thereby producing the necessary extension.

No. 2 assistant stands by the injured part and supports the fracture above and below.

III. Clove-Hitch.—On the word "three" to form the clove-hitch the operator takes a length of 9 feet of flannel bandage. Holding it in the left hand by its midpoint, he grasps the center of the left half with his right hand, palm to the right, and makes a loop which is carried up and passes behind the left hand, thus forming a clove-hitch with a diameter of 10 inches. This is applied over the boot, with the short end on the outer side; the long end is carried under the instep, up and through the loop round the ankle. The two extension bands thus produced are ready to be attached to the splint later on.

IV. Splint.—On the word "four" the operator threads on the splint, No. 1 assistant removing and reapplying upper and lower hands alternately to allow the ring to be passed over the foot. The splint should be pushed up under the buttock as far as possible, care being taken to keep the notched transverse bar horizontal.

No. 2 assistant, as before, steadies the thigh.

V. Fixation of Leg.—On the word "five": 1. The extension bands of the clove hitch are tied around the notched bar at the end of the splint as follows. The outer band is passed over and under the bar, and then round the notch, drawn taut, and held over to the opposite side. The inner band is passed under and over the bar, then also round

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the notch, where it crosses the first band and prevents its slipping. The two are finally tied off by a half bow.

2. The middle flannel sling is tied behind the knee, which is held partly bent by No. 2 assistant.

3 and 4. The slings behind the ankle and the calf are tied, so that the leg now rests in a shallow trough, with its center on a level with the long bars of the splint.

5. To prevent the leg rising off the splint, the center of a narrow fold bandage is placed across the leg, just below the knee, the ends

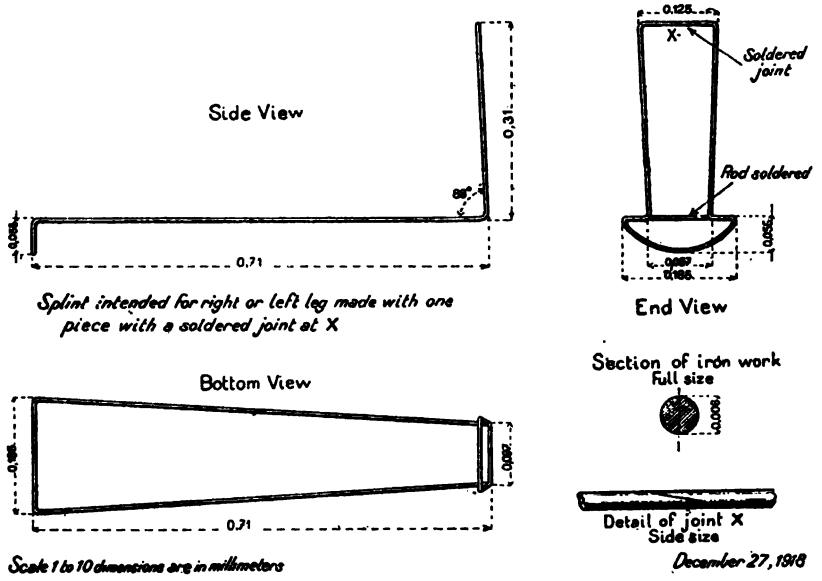

FIG. 7.—MECHANICAL DRAWING OF CABOT POSTERIOR WIRE LEG SPLINT.
(To be used with or without side splints.)

Uses.—(*a*) Injuries to the soft parts of the lower limb requiring fixation in transport. (*b*) Slight injuries to the knee or ankle requiring fixation in transport. (*c*) Fractures of the fibula. (*d*) Wounds of the ankle joint. (*e*) Injuries to the foot.

The rods of the splint should be thoroughly padded and they may be bent to allow flexion at the knee if desired.

Side splint of wood or wire ladder may be used in connection with the splint if desired.

are carried down between the leg and the splint, brought up outside the bars and then tied in front of the leg. The lower limb is now firmly fixed in a position of extension, and it may be moved freely without causing pain to the patient or damage to the injured part.

VI. Dressing Wound of Thigh.—On the word "six" the wound is exposed by cutting away the overlaying portion of the trousers on the front or back of the thigh, and the dressings are then applied.

VII. Coaptation Splints and Bandages.—On the word "seven" the Gooch or coaptation splints are applied. The short piece is placed

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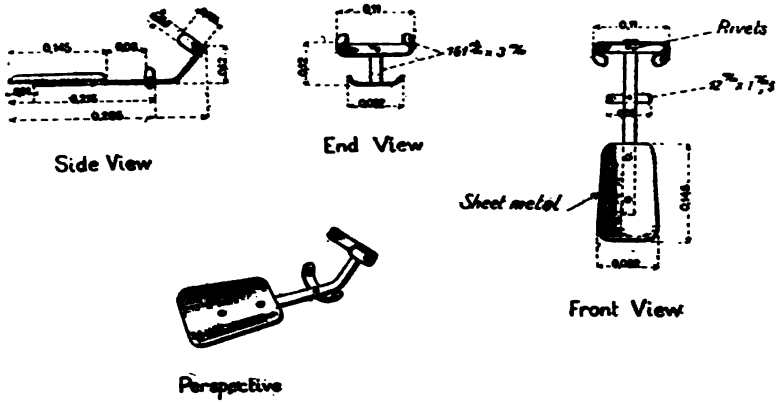
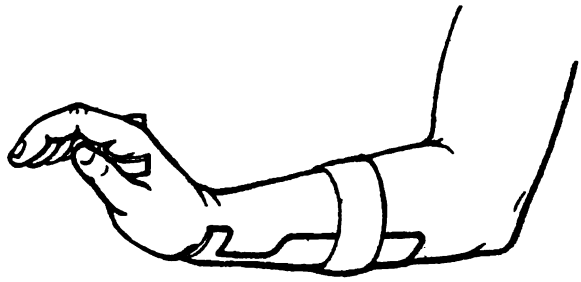
behind and secured by tying the remaining two slings. The long piece is placed on the front of the thigh, care being taken to avoid pressure on the knee cap. The whole is now retained in position by the two narrow fold bandages, carried round the thigh outside the bars of the splint.

VIII. Stirrup and Figure of Eight.—On the word "eight" the stirrup (Fig. 1) is sprung into the splint above the ankle, its foot toward the stretcher. A bandage is then applied to form an additional sling and by a figure of eight turn to prevent lateral movement of the foot.



Scale 1 to 10 dimensions are in millimetres

FIG. 8.—MECHANICAL DRAWING OF JONES "COCK-UP" OR "CRAB" WRIST SPLINT



JONES "COCK-UP" OR "CRAB" WRIST SPLINT APPLIED.

IX. Spanish Windlass.—On the word "nine" the extension bands are tightened, and a small piece of wood or a nail is introduced to increase the tension by twisting up as required.

X. Pad in Ring.—On the word "ten" a pad is placed inside the ring on the outer side of the thigh to act as a wedge and prevent undue movement.

XI. Suspension Bar.—On the word "eleven" the suspension bar is fitted to the stretcher with the "feet" away from the rackets. The

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splint is slung up three finger breadths from the horizontal part of the suspension bar. To damp down the side movements, lateral tapes are tied to the uprights. For the journey in a motor ambulance an additional band may be passed from the splint round one handle of the stretcher.

XII. Hot-Water Bottles and Blankets.—On the word "twelve" hot-water bottles are applied. The third blanket is folded into two lengthwise, and laid over the patient. The hanging folds of the first and second blankets are brought up over this so that the patient is evacuated with four folds of blanket in front as well as behind.

The record time in the British Army, somewhat bettered in our own, for the complete application of the Thomas splint in accordance with the details of the drill was two minutes, and every stretcher-bearer was expected to be able to apply it in less than six minutes.

SPLINT SUPERVISION

Orthopedic consultants were assigned to every division and in many divisions, in addition, there were orthopedic surgeons acting directly under the division surgeons almost as regimental surgeons. These medical officers assisted in giving the splint drills and, in times of combat, carefully supervised and inspected the direct application of the splints to the wounded. They saw to it that ample supplies of splints were kept in all the battalion aid posts. As a result of this supervision the wounded arrived at the evacuation hospitals, almost without exception, well splinted.

MANUFACTURE OF SPLINTS

As soon as the manual above referred to was approved, models of these splints were furnished to the American Red Cross and their manufacture and storage immediately begun. Many small mechanics shops in Paris were converted into splint shops. French mechanics were trained and the most excellent work turned out under the supervision and constant inspection of the American Red Cross. Except for a few thousand splints of the types common to both British and American armies, which were purchased by the American Government from the British, the entire splint supply of the American Army was manufactured by the French Branch of the American Red Cross.

SUPPLY OF SPLINTS

The supply of splints was, at times of great pushes, sometimes strained, but was kept up to the demand to an unhoped-for degree. The weekly supply sheet published by the Red Cross gave a list of the number of these splints on hand on a given date, and the number of splints already disposed of. Occasionally it was necessary to send

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camions loaded with splints directly from Paris to a hard-pushed division, but in the main the medical supply depots kept the hospitals and the battalion dressing stations well stocked.

MANUFACTURE OF DRESSINGS AND ACCESSORY SUPPLIES

Dressings and accessory supplies were also manufactured by the Red Cross in large and well-lighted rooms in Paris. The sterilization was all done in France, though many of the dressings were made in

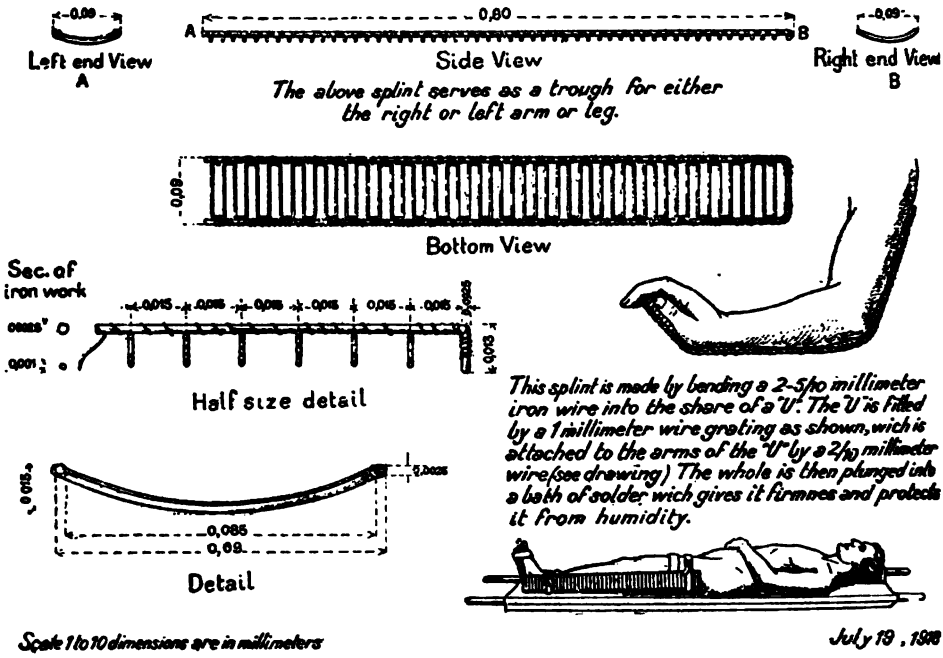
0,80
A
B
Left end View
A
Side View
Right end View
B
The above splint serves as a trough for either the right or left arm or leg.
Bottom View
Sec. of iron work
Half size detail
This splint is made by bending a 2-5/10 millimeter iron wire into the shape of a "U". The "U" is filled by a 1 millimeter wire grating as shown, which is attached to the arms of the "U" by a 2/10 millimeter wire (see drawing) The whole is then plunged into a bath of solder which gives it firmness and protects it from humidity.
0,085
0,09
Detail
Scale 1 to 10 dimensions are in millimeters
July 19, 1918

FIG. 9.—MECHANICAL DRAWING OF LADDER SPLINT MATERIAL.

Uses.—(*a*) For shoulder, upper arm, elbow, forearm, wrist, hand, lower leg, ankle and foot splints. (*b*) For side splints in combination with Cabot posterior wire leg splint. (*c*) For coaptation splints. (*d*) For various uses where malleable light splint material is to be desired.

America from standardized samples sent over to the United States. They were distributed also to the medical supply depots and thence to the hospitals and dressing stations. Without the generous and efficient help of the Red Cross it is difficult to say how the splints and dressings could have been ready in sufficient quantities at the time they were needed. The debt which the Army owes to the Red Cross is a heavy one in this respect. The quality of the splints was always good, and the accurate manufacture and sterility of the dressings were constant.

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TRANSPORT TO AMERICA

For transport to America these same standardized splints have been used and, with the exception of the frequent use of plaster of Paris, they have been the only types used for ocean travel and have proved efficient under these conditions also.

It has been evident to all surgeons at the front, and equally evident to medical officers in the rear and in the home hospitals of America, that the standardization and simplification of the transport splints and the splint drills which were held in all the divisions prior to combat duty, have resulted in the bone and joint cases being received at the evacuation hospitals in remarkably good condition, and to a very large degree have eliminated one of the commonest causes of shock. The splint system has aided very materially in the prevention of deformity. The national burden of the cripple has been lightened.

In the early days of the war, before anything like careful radial control of the bone and joint cases was possible in the English and French armies, and before the splinting was in any sense standardized and carefully supervised by specially trained surgeons, the number of preventable deformities which were returned to the home hospitals was very considerable. In certain home hospitals they were estimated by some of the surgeons to comprise over 30 per cent of these bone and joint injuries. Motion had not been conserved, favorable conditions for ankylosis had not been retained, and, while it was easy to understand the way in which these unhappy conditions occurred, their existence showed that more improvement in the system was possible.

RESULTS AS SEEN IN AMERICAN HOME HOSPITALS

We have outlined the very careful system of drill and supervision which was organized in our Army as a result of this British and French experience, and it was with a very great interest that we began to review our bone and joint cases after they were returned to America. The results have been almost unexpectedly satisfactory. They have seemed to show that meticulous attention to very early and very carefully standardized splinting, the radial control of cases from the point of view of conservation of function and the maintenance of position of joints favorable to function even if ankylosis should occur, have resulted in the very low percentage of preventable deformities our wounded are showing on their return to America.

It has been possible, by means of terminal clearing stations, to halt the cases coming down to the base ports and correct many of the slight deformities which had occurred on the other side. It seems to us a cause for congratulation that it has been possible to escape these preventable deformities representing, as they do in the first place, a heavy and unnecessary burden for the soldier and also for the body politic.

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A DEPENDABLE BANDAGE ROLLER

By NORVELLE WALLACE SHARPE, M.D., F.A.C.S
Late Captain, Medical Corps, United States Army

(With one illustration)

Some years ago a hand-driven bandage rolling apparatus was usually part of the equipment of a surgeon's office, likewise was such to be found in the stock of the surgical service of most hospitals. Numerous types, of a more or less complicated construction, were regularly listed in current instrument catalogues.

This period was followed by factory-made bandages, of excellent character, with a corresponding diminution in the general usage of the individual bandage roller.

During, and subsequent to, the period of the war there has been an increased demand for individual bandage rollers, partly by surgeons, partly by numerous Red Cross Chapters, partly by civilian and military hospitals. The notable advance in cost of cotton fabrics has stimulated this means of efficient economizing.

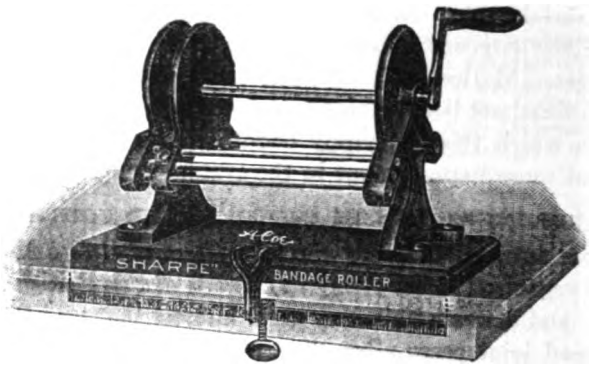

PLATE 1

That the majority of bandage rollers, accessible in the shops, are either fragile in construction, needlessly complicated in mechanism, or unduly expensive, is obvious.

A fairly extensive employment of well-known types by the surgical classes in the Medical Department of St. Louis University has exhibited the fact that a bandage roller that would withstand the grueling manipulations of the sophomores had not been found.

Some years ago, I devised a roller that has afforded me yeoman service. It was simple in design, strong, dependably efficient, not

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unreasonably expensive. Aloe & Co. has succeeded in reproducing my model.

This roller has proved satisfactory under the severe usage given by large classes of medical students, and in the hands of sundry Red Cross Chapters, that have either purchased it primarily, or have abandoned other models less desirable and usually more expensive.

Plate I exhibits this roller, which will readily develop bandages up to 6 inches in width. Upon a substantial hard maple base (12 inches by 5 inches by ¾ inch) have been erected two upright flanges of gray iron. Upon connecting guide bars (3/16-inch cold rolled steel) plays a movable gauge (4 inches in diameter), controlled by a set screw. A central steel rolling bar, 5/16-inch hexagon, terminates in a stout crank, with handle of wood. Finish: nickel, enamel, and varnish.

If permanence is desired, the base may be screwed to table or bench; if portability is preferred the clamp, which is furnished, should be employed. The manufacturer guarantees material and workmanship.

Loyal efforts to coöperate with the orders of the Surgeon General, in economic disposition of surgical dressings, would have been greatly facilitated had strong bandage rollers of this type been made generally accessible.

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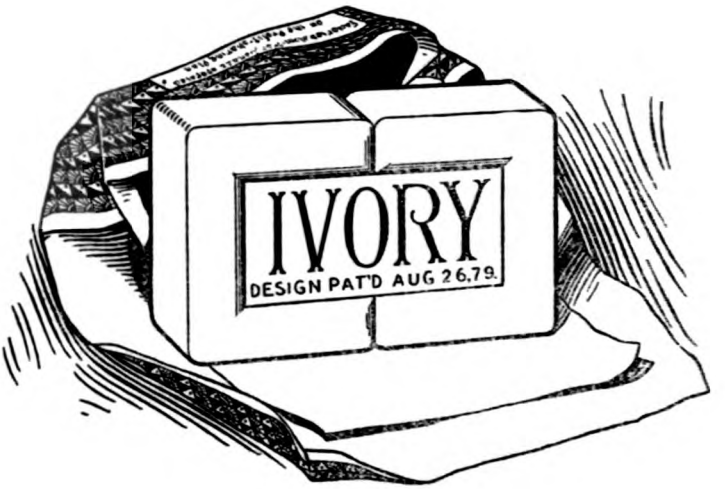

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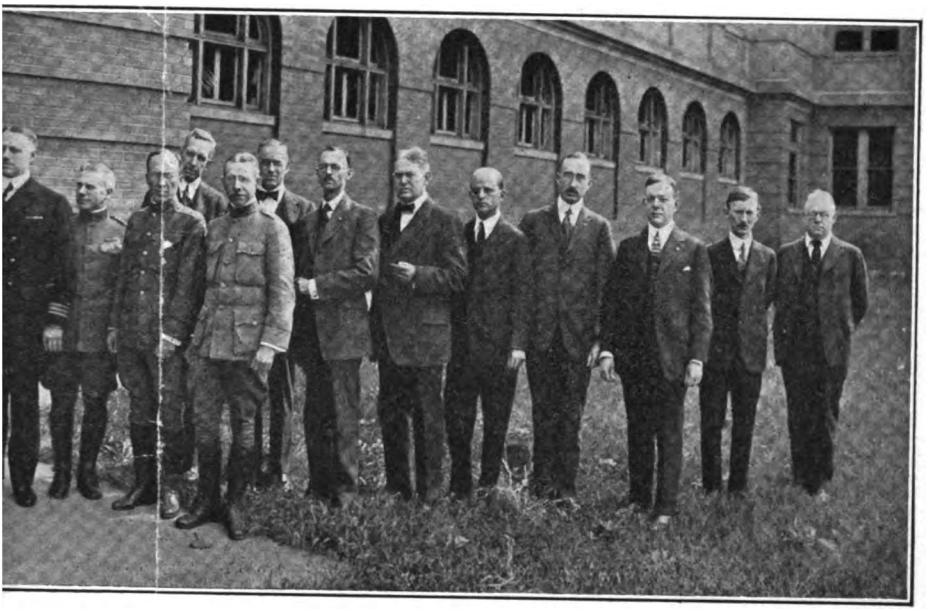

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THE
MILITARY SURGEON

VOL. XLV DECEMBER, 1919 NUMBER 6

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

PROCEEDINGS OF THE TWENTY-SEVENTH ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES.

ST. LOUIS, MO., OCTOBER 13-14, 1919, STATLER HOTEL

THE MINUTES OF THE MEETING

THE twenty-seventh annual meeting of The Association of Military Surgeons of the United States convened at St. Louis, Mo., October 13, with Col. H. P. Birmingham, Medical Corps, U. S. A., Retired, in the chair.

The official registration was about one hundred, and in this, many of the older members.

The order of procedure was as follows:

Opening Meeting, 9.30 a. m.

1. Address of the President.

Reports of Executive Council, Secretary-Editor and Treasurer, Committee on Arrangements, Literary Committee, Committee on Legislation, Boards of Award, Necrology Committee.

Appointment of Nominating Committee, Auditing Committee and Committee on Resolutions.

Consideration of Amendments to Constitution and By-laws.

Miscellaneous business.

2. Addresses:

"The Next Steps in Combating Venereal Diseases among the Armed Forces of the United States," Col. Wm. F. Snow, M. C., U. S. Army.

"Logistics of the Naval Medical Department for Distant Operations of the Fleet," Capt. F. E. McCullough, M. C., U. S. Navy.

Second Session, 2.00 p. m.

1. Addresses:

"Plan for the Immediate Care and Reconstruction of Battle Injuries of the Face and Jaws, Based on Our Late Experiences," Lieut. Col. Vilray P. Blair, M. C., U. S. Army.

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"The Army Medical Museum," Col. Charles F. Craig, M. C., U. S. A. (Read in absentia.)

Third Session, 8.30 *p. m.*

1. Motion pictures, showing activities of the Medical Department in France. (One-half hour.)

2. Address:

"A Scientific Basis for the Greater Resistance of the Seasoned Soldier, as Compared with the Recruit, to Infectious Diseases," Col. Victor C. Vaughan, M. C., U. S. Army.

TUESDAY, OCTOBER 14.

Fourth Session, 9.30 *a. m.*

1. Report of Nominating Committee.

2. Election of Officers.

3. Addresses:

"Some of the Earlier Problems Confronting the Medical Corps of the American Expeditionary Force," Col. S. H. Wadhams and A. D. Tuttle, M. C., U. S. A. (Read by title.)

"The Military Aspect of Base Hospitals," Lieut. Col. Gustavus M. Blech, M. C., U. S. A.

"The Care of Six Hundred Cases of Penetrating Wounds of the Chest," Lieut. Col. Walter Fischel and Maj. Hugh McCulloch, M. C., U. S. A.

4. Installation of Officers and Reports of Committees.

1.00 *p. m.*

Luncheon at Washington University School of Medicine.

Fifth Session, 2.00 *p. m.*

In the Auditorium of Washington University School of Medicine.

1. Addresses:

"British Ambulance Trains" (illustrated), Capt. Frank L. Pleadwell, M. C., U. S. Navy.

"The Importance of Physical Therapy in Military and Civil Practice," Commander Wm. Seaman Bainbridge, M. C., U. S. N. R. F.

"Observations on an Epidemic of Influenza in an Isolated Post of the A. E. F.," Maj. Alan M. Chesney, M. C., U. S. Army.

"Physical Reconstruction in U. S. Army Hospitals," Lieut. Col. Horace M. Evans, M. C., U. S. A. (Read by title.)

The headquarters of the Association were at the Hotel Statler, and the meetings, with the exception of the Fifth Session, were held in the assembly room there.

On Tuesday the members of the Association were the guests of the

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Washington University Medical School at luncheon, and the fifth and final session was held that afternoon in the auditorium there.

Colonel Birmingham, our president, called the meeting to order and addressed it as published in our November isssue.

Following the address by the president, the following reports were read by the secretary:

REPORT OF THE EXECUTIVE COUNCIL

The Executive Council met seven times during the year at the call of the president. Usual routine business of the Association was conducted and certain expenses incident to the publication of the magazine were authorized.

There were 1,776 medical officers of the various services elected to membership by the Council during the past year.

As secretary, and editor and treasurer of the magazine, I think I should manifest, as I have in one of my other reports, the very liberal attitude of the Council toward me as steward in this capacity, and, as I have said elsewhere, the work of the council and their support have been a great help in the transaction of the business of the Association as centered in me in these three activities.

There were no resolutions or amendments brought up before the present Council for action by the Association.

REPORT OF THE TREASURER

Mr. President, and Members of The Association of Military Surgeons, U. S.

I have the honor to submit the following report for the period since our last annual meeting to date:

RECEIPTS

Admission fees	$8,999.25
Annual dues	9,205.06
Subscriptions	2,955.10
Advertising	17,624.52
Miscellaneous (including sale reprints and insignia)	2,879.94
Total receipts	$41,663.87
Cash balance, October 1, 1918	2,240.66
Total	$43,904.53
Less disbursements as noted below	42,498.86
Leaving a cash balance in National Bank of Washington, September 30, 1919, of	$1,405.67

DISBURSEMENTS

Printing journal (12 months)	$25,355.03
Salaries and commissions	4,829.91
Postage	2,104.44
Stationery and printing	1,870.90
Cost of reprints	1,731.43
Telephones	94.95
Dishonored checks	157.67
Expenses of meetings	689.35
Miscellaneous (including cost of insignia, audit, carfare, etc.)	1,141.68
Wellcome Prize	300.00
Total	$38,275.36
Transferred to investment account	4,223.50
Total disbursements	$42,498.86

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INVESTMENT ACCOUNT

Balance October 1, 1918	$21,034.53
November 26, 1918, transferred from cash account	223.50
December 23, 1918, interest Union Trust Co.	10.26
December 30, 1918, interest American Security and Trust Co.	10.06
January 8, 1919, transferred from cash account	2,000.00
March 17, 1919, transferred from cash account	2,000.00
March 17, 1919, coupons	318.75
April 26, 1919, coupons	80.80
June 30, 1919, interest American Security and Trust Co.	4.19
June 30, 1919, interest Union Trust Co.	28.61
September 15, 1919, coupons	318.75
September 15, 1919, Wellcome Prize Money	500.00
Total	$26,529.45

ASSETS, OCTOBER 1, 1919

Third Liberty 4¼ per cent Bonds	$15,000.00
Fourth Liberty 4¼ per cent Bonds	4,000.00
Victory 4¾ per cent Bonds	6,000.00
Balance at American Security and Trust Company	956.05
Balance at Union Trust Company	573.40
Total	$26,529.45

There is a balance on the current account (National Bank of Washington) not included in the above report of $2,244.12, making the total wealth of the Association, October 10, 1919, $28,773.57.

An analysis of the above report will show that, notwithstanding the increased cost of production, the Association was enabled to save $5,494.92 during the past year.

REPORT OF THE SECRETARY-EDITOR

Mr. President, and Members of the Association of Military Surgeons:

I have the honor to submit herewith a report of the activities of the office of secretary-editor of The Association for the period from November 26, 1918, to date.

On November 26 I took over the duties of secretary-editor from Col. L. A. La Garde, who, in addition to his other duties, had carried on this work pending the selection by the Executive Council of someone to fill the office.

Under the able administration of Colonel Munson the affairs of the Association had prospered exceedingly, and it was plain that he had set a high standard of excellence to be maintained.

It is gratifying to report that, while the advance in the past eleven months has not been so marked as for the preceding year, the affairs of the Association have not suffered. Reference to the report of the treasurer will show this.

The following is the membership to date:

GOOD STANDING

U. S. Army	4,872	
U. S. Navy	324	
National Guard	243	
U. S. P. H. S.	82	
Associate	12	
Honorary	60	
		5,593

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DELINQUENT

U. S. Army	2,064	
U. S. Navy	113	
National Guard	221	
U. S. P. H. S.	51	
		2,449
Total membership		8,042

The most troublesome factor in regard to this is the element of delinquent members. It will be noted that this is at present 2,449. This comprises both those who are in arrears for a few weeks only and the inevitable percentage which will go the two years allowed under the Constitution before being dropped.

The secretary has taken all the measures possible to increase the circulation, and, while there has been a response to the letters sent, it has not been so general as it is hoped it may be in the future.

It is believed that much might be accomplished if the members of the Association coöperated in this work. It seems self-evident that better results would ensue if those who are now members would, when possible, secure new members from those of their acquaintance who are eligible to join. I touch on this point as one affecting the welfare of the Association.

The policy of the magazine—THE MILITARY SURGEON—has been clearly established, and no attempt has been made by the present editor to make any radical change. Articles of a political significance have not been accepted, and the effort has been made to keep the publication what it started out to be—a live, interesting, up-to-date technical work, valuable not only for current reading but also, when bound, as a book of reference.

It has seemed wise to the editor to make one change—that is, instead of publishing three or four long, original articles in each number, to print a larger number of contributions. It was believed that in this way there was a better chance of each reader finding in each number something of personal interest. Furthermore, the number of illustrations has been increased in the belief that their graphic value offsets the added cost. The issues of the magazine since January 1 of the present year must stand for judgment as to whether these changes meet the approval of the membership. It is and has been the belief of the editor that the relation between him and the members should be a personal one, and this has been expressed editorially. It is my wish to serve the membership personally in any way in which I properly can, and any letter in search of information will be answered as promptly and satisfactorily as possible.

At the time I took over the duties there was dissatisfaction expressed because contributors received no free reprints. This matter was laid before the Executive Council, and they directed that to each author of an accepted original article 100 free reprints should be sent. While this is an extra expense, it is believed that it is a wise one and has given general satisfaction.

The office has not escaped the effect of the H. C. of L. and, due to an increase in cost of materials and wages, the cost of publication has advanced since January 1, 1918, about 15 per cent.

The absolute supervision of the affairs of the Association has not been in the hands of the secretary-treasurer and editor. No question of any importance has been decided by him, but referred for discussion and final settlement by the Executive Council, and he has acted by their direction and in accordance with their views. This has insured a careful scrutiny of all matters of importance and that any policy adopted should have their sanction.

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Resultant on the merging of the three offices in one, the present secretary-editor and treasurer was voted a salary of $100 per month, or an increase of $25 over what was formerly paid the treasurer. One additional clerk at $80 per month was authorised by the Council, and for a time an extra clerk was temporarily engaged in propaganda work in the increase of circulation.

In January, 1919, there were in the office nearly 3,000 certificates of membership to be addressed and mailed. These have all been sent out, in addition to the routine work of the office, and this work is now up to date. Further, in the propaganda work to secure new members, nearly 20,000 letters have been sent out.

The value of the Association as an educational force has been recognized by the Surgeons-General of the services as well as by other public bureaus.

The secretary-editor desires to acknowledge gratefully the support of the president and the members of the Executive Council. They have been generous in their aid and have done much to make easier the duties of an exacting office. There have been seven meetings of the Executive Council during the past year.

It is not within the bounds of probability that the same rapid expansion which marked war-time activity will prevail in post-bellum days, but there should be no reason why an association of as proved merit as this is should not continue to forge ahead and be a factor in the affairs of medical education.

The secretary then reported as follows:

THE SECRETARY: At recent meetings of the Executive Council of The Association of Military Surgeons the following nominations for honorary membership in the Association were brought before the Council, and it was recommended that their names be proposed before the Association at this annual meeting for election. I will read the list, which is as follows:

NOMINEES FOR HONORARY MEMBERSHIP

ENGLAND

Army

Major General Sir Charles Burtchaell, K.C.B., C.M.G.
Major General Sir Maurice Holt, K.C.M.G., C.B., D.S.O.
Major General Sir William Leishman, K.C.M.G., C.B., F.R.S.
Sir William Osler.
Lieut. General Sir Arthur T. Sloggett, K.C.B., C.M.G., K.H.S.
Colonel Sir Harold J. Stiles, M.B., C.M., R. A. M. C.
Colonel Charles W. Cathcart, R. A. M. C.
Colonel Francis M. Caird, R. A. M. C.
Colonel Alexis Thomson, R. A. M. C.
Colonel Sir Berkeley Moynihan.
Colonel James W. B. Hodsdon, R. A. M. C.

Navy

Surgeon Rear Admiral Sir Robert Hill, C.B., C.V.O., R.N., Medical Director-General, R. N.

Surgeon Rear-Admiral Sir Humphrey Davy Rolleston, K.C.B., M.D., F.R.C.P.

Surgeon Rear-Admiral Sir William Watson Cheyne, Bt., K.C.M.G., C.B., F.R.C.S., M.P.

Surgeon Rear-Admiral Sir William Macewen, C.B., M.D.

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Surgeon Rear-Admiral Sir George Lenthal Cheatle, K.C.B., C.V.O., F.R.C.S.
Surgeon Rear-Admiral Sir Arthur Edmunds, C.B., M.B., F.R.C.S.
Surgeon Rear-Admiral George Robertson Turner, C.B., F.R.C.S.
Surgeon Captain Ernest Courtney Lomas, C.B., D.S.O., M.B., F.R.C.S. (Ed.).
Surgeon Commander Richard Cleveland Munday, C.B.
Surgeon Commander David Walker Hewitt, C.M.G., M.B., F.R.C.S.

FRANCE

Army

Dr. Alexis Carrell.
Medecin Insp. Sieur.
Medecin Insp. General Vincent.
Medicin Insp. General Rouget.
Prof. Theodore Tuffier, Consulting Surgeon to the French Armies.

Navy

Medicin General Chevalier
Medicin General Duval.
Medecin General Bellot.

JAPAN

Army

Surgeon General Teijiro Tsuruta, I. J. A.

Navy

Surgeon General Tadao Honda, I. J. N.

ITALY

Army

H. E. Lieut. General Cav. Giuseppe Sciumbata, Surgeon General, Italian Army.
Lieut. Col. Raffaele Bastianelli.

Navy

Dr. C. M. Belli, Ten. Colonello Medico, R. I. N.
Prof. Aldo Castellani, R. N.
Lieut. General Comm, Filippo Rho, Surgeon General, Royal Italian Navy.

BELGIUM

Army

Lieut. General Melis.
Colonel Antoine Depage.

SERBIA

Colonel Voj. Subotitch, Sr.

CANADA

Lieut. Colonel D. A. Clark, Canadian Medical Services.
Lieut. Colonel E. L. Warner, Canadian Medical Services.

CUBA

Lieut. Comdr. J. F. Figueroa, Cuban Naval Medical Service.
Major Augusto Dias Brito.
Major Juan F. Sordo.

ARGENTINE REPUBLIC

Prof. Pedro Chutro, agrégé de Chirurgie, Chirurgien Des Hopitaux, Buenos Aires.

General Griffith moved that the gentlemen named be elected as

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honorary members of the Association and that this be indicated by a rising vote. The motion was carried.

The following medical officers who were present as delegates from Canada and the Republic of Cuba were then called before the Association by the secretary, who addressed them as follows and invested them with the badge of the Association in token of their election to membership:

"Lieut. Colonel D. A. Clarke, of the Canadian Army Medical Corps, a gallant soldier of the empire to which his country and ours claim kin; wounded in her service at the first battle of Ypres, and stalwart in loyal defense of the mother nation, it is a pleasure and an honor to invest you, a representative from our neighboring land, with this the insignum of our Association."

"Lieutenant Colonel E. L. Warner, of the Canadian Army Medical Corps, a member of the British Expeditionary Force, a staunch soldier tried by the ordeal of battle, we welcome you to membership in our Association and, as evidence thereof, it is a pleasure to present you with this the medal of our Society."

"J. F. Figueroa, Medico Mayor de la Marina de la Republica de Cuba, the senior in your branch of the service and distinguished in your profession, we are honored to claim you as a member of our Association and to evidence this by the presentation of this badge."

"Augusto Dias Brito, Medico de 'l ejercito de la Republica de Cuba, a soldier of one of our sister Republics, bound to us by many ties, we esteem it a privilege to count you as one of our Association and it is a pleasure as evidence of this to tender to you this badge of membership."

"Comandante Juan F. Sordo, Medico de 'l ejercito Cubano, trusted by your country and honored by her with an office in her armed forces, with years still at your disposal to prove the wisdom of her choice, we welcome you to membership with us and with this badge, induct you into our Association."

Subsequent to this the following letters were read by the secretary from distinguished members in answer to an invitation to attend the meeting:

WAR OFFICE, CORNWALL HOUSE
STAMFORD STREET, S. E. 1,
26th August, 1919.

COLONEL JAMES R. CHURCH,
Medical Corps, U. S. Army,
Army Medical Museum,
Washington, D. C.

DEAR COLONEL:

Thanks very much for your letter of August 17.

I wish that it had been possible for me to attend the Annual Meeting of the Association of Military Surgeons this year, but, of course, it is impossible—I am overwhelmed with work at present

I shall think of you all at the meeting in October 13 to 15 and wish you a most successful gathering.

I well remember the meeting which I had the privilege of attending in 1917, and how much I enjoyed it.

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A great deal has happened since then, and I think you will agree with me that the Medical Service of the United States Army and also its brother Medical Service of the British Army have made great strides in development and improvement. We have worked in close collaboration, which is the only way to attain mutual improvement and efficiency.

I hope, and most sincerely believe, that it will always be so.

May I convey to you all the good wishes of myself personally and also of all my brother officers in the Royal Army Medical Corps.

With kindest regards,

Believe me,

Most sincerely yours,

T. H. GOODWIN.

DEPARTMENT OF MILITIA AND DEFENCE

OTTAWA, CANADA,
9th October, 1919.

THE PRESIDENT OF
THE ASSOCIATION OF MILITARY SURGEONS
OF THE UNITED STATES,
Washington, D. C.

SIR:

I have the honour to convey to you by Lieut. Col. D. A. Clark of my Staff here, and through you to all the officers of the various services of the United States present at the annual meeting of The Association of Military Surgeons of the United States, the greetings of this headquarters and of the medical officers of the Canadian Expeditionary Forces and of the Permanent and Active Militia Forces of Canada.

It is desired to wish to you, Sir, and to the meeting over which you preside, all good fortune, not only for the progress of the meeting, but in the discharge of the very important public duties with which the services represented at your meeting are entrusted by the government of their great country.

I venture, also, to express the hope that the old friendship and good will which has existed between the services of the British Empire and of the United States, and which has been so fortunately enhanced by the experiences of the great war, may prove to be nothing more than a sound foundation upon which there may be built up, without any future interruption, a superstructure of permanent good relations and coöperation, from which it is felt that nothing but good can accrue to the real interests, not only of our respective countries and their people, but of civilisation throughout the world at large.

I have the honour to be, Sir,

Fraternally yours,

J. T. FOTHERINGHAM,
Major General, Director General of Medical Services.

WASHINGTON, D. C., *October* 7, 1919.

COLONEL JAMES ROBB CHURCH, M. C., U. S. A.,
Editor, Army Medical Museum,
7th and B Sts., S. W.,
Washington, D. C.

MY DEAR COLONEL:

I wish to acknowledge receipt of your letter of the 4th instant and at the same time regret to advise you that it will be impossible for me to be present at the annual meeting of The Association of Military Surgeons in St. Louis, Missouri.

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I trust you will be kind enough to extend to General Birmingham my appreciation of his thought of me.

Very truly yours,

W. C. Braisted,
Surgeon General, U. S. N.

TREASURY DEPARTMENT

Public Health Service

Washington, D. C., *October* 6, 1919.

Col. James Robb Church, M. C., U. S. A., *Secretary,*
The Association of Military Surgeons,
Army Medical Museum,
Washington, D. C.

My Dear Colonel Church:

I have your kind letter of October 4, inviting me to attend the annual meeting of the Association in St. Louis, Mo., from October 13 to 15.

It is with deep regret that I am compelled to decline your kind invitation, but the pressure of official matters necessitates that I remain in Washington during that time.

Please say to General Birmingham that I also appreciate deeply his kind invitation and that I wish for every success at the meeting.

With kind regards, I am,

Very sincerely,

Rupert Blue.
Surgeon General, U. S. P. H. S.

WAR DEPARTMENT

Office of The Surgeon General

Washington, *October* 2, 1919.

Colonel James Robb Church, M. C.,
Editor, The Military Surgeon
Army Medical Museum,
Washington, D. C.

My Dear Colonel Church:

Referring to our telephone conversation of this morning, I regret to say it is impossible for me to attend the St. Louis meeting.

I have had this meeting in mind for some time and hoped very much that I would be able to be present; but the demand of the work of the office at this time is so heavy that it is absolutely impossible for me to give up the necessary time to go to St. Louis.

I have the interests of The Military Surgeon very much at heart and sincerely trust the meeting at St. Louis will be a great success.

With cordial regards,

Very sincerely yours,

M. W. Ireland,
Surgeon General, U. S. Army.

At the conclusion of this reading, Brig. General S. C. Stanton read the report of the Committee on Necrology which comprised eighty names of members of the Association. This report was accepted by the Association standing.

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Following this, the president directed that the secretary read the amendment to the Constitution and By-laws which was proposed at the twenty-sixth annual meeting and coming up for vote at this time.

THE SECRETARY: This is an amendment to the Constitution and By-laws which was proposed at the last annual meeting and has laid over for the required year to be brought up for action by the present meeting of the Association. It is more or less of a routine matter, following the action of the Association in merging the three offices of secretary, editor and treasurer in one; it is designed to correct the verbiage in the Constitution and By-laws so that the present reading will not conflict with the actual state of facts. It reads as follows:

Whereas actual experience has demonstrated the very intimate business relationship between the offices of Secretary-Editor and Treasurer of the Association, without which coördination is most difficult and errors in accounts and addresses very frequent, all resulting in dissatisfaction to and criticism by the membership; therefore

Resolved, that Section II, Article IV of the Constitution be amended by eliminating the words "And a" between the words secretary and treasurer, in the fourth line, and substituting a hyphen combining the two offices in one. And in all articles of the Constitution and all By-laws where duties are prescribed for secretary or treasurer, the designation secretary-treasurer shall be substituted therein.

Approved by the Executive Council and ordered submitted to the annual meeting, August 1, 1918.

Presented at Annual Meeting, 1918, for vote at this meeting.

The amendment was voted on and carried.

Commander William Seaman Bainbridge of the Navy then proposed the following amendment to the Constitution:

Article 3, Section 3: Add as a 6th classification the following: "All medical members and Medical Examiners of Local Medical Advisory and District Boards, officially appointed by the President of the United States, the Provost Marshal General of the United States Army and the Governors of the various states for the purposes of the Selective Draft Act."

Add as a 7th classification the following: "Ex-Medical Officers."

Add as an 8th classification the following: "Acting Assistant Surgeons (Contract Surgeons) of the U. S. Army, Navy and Public Health Service."

Section 5 of Article 3: Strike out "1. Ex-medical officers and. "Strike out "5. Acting Asst. Surgeons (Contract Surgeons) of the U. S. Army, Navy and Public Health Service."

Renumber the remaining paragraphs one, two and three.

This amendment was laid on the table for consideration at the next annual meeting of the Association.

THE SECRETARY: There was a communication received some time ago from one of the members in regard to the organization of local chapters in the various states. The secretary has the correspondence here and will read it for the information and action of the Association. The letter is signed by Dr. D. J. Saunders, of Fort Worth, Tex. In

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the second paragraph, which is germane to this subject, he said, "Please advise me if I was accepted to membership in The Military Surgeons' Association, and also if those returning from service can organize some kind of local association under the above name." This letter was acknowledged by Colonel Birmingham with the information that the matter would be brought up before the next meeting of the Association. The Executive Council last night considered this matter and directed that it be presented to the annual meeting today, and that it be left with the Association for its action.

A committee was appointed by the president to consider the question and report in detail at the next annual meeting.

The president then named the following committees:

Nominating Committee

Brig. General J. D. Griffith, Mo. N. G., Ret., Col. L. A. LaGarde, U. S. Army, Retired, Capt. F. E. McCullough, M. C., U. S. N., Col. F. F. Russell, M. C., U. S. A., Asst. Surg. General J. C. Perry, U. S. P. H. S.

Auditing Committee

Brig. General S. C. Stanton, Ill. N. G., Ret., Surgeon J. W. Kerr, U. S. P. H. S., Commander W. S. Bainbridge, M. C., U. S. N.

Resolutions Committee

Col. V. C. Vaughan, M. C., U. S. A., Capt. F. L. Pleadwell, M. C., U. S. N., Dr. Horace Brown.

At the conclusion of this business program of the session, an address by Col. W. F. Snow on "The Next Steps in Combating Venereal Diseases among the Armed Forces of the United States," was read and discussed by Colonels Vaughan and Russell.

The meeting then adjourned to the session at 2.00 p. m.

At the second session at 2 p. m. the following addresses were read and discussed: "Logistics of the Naval Medical Department for Distant Operations of the Fleet," Capt. F. E. McCullough, M. C., U. S. Navy.

"Plan for the Immediate Care and Reconstruction of Battle Injuries of the Face and Jaws, Based on Our Late Experiences," Lieut. Col. Vilray P. Blair, M. C., U. S. Army.

Following these a paper on "The Army Medical Museum," by Col. Charles F. Craig, M. C., U. S. A., was read by the secretary in the absence of Colonel Craig. The meeting then adjourned to meet at 8.30 p. m.

The third session opened with half-hour motion pictures, showing the activities of the Medical Department on the French front in the Verdun sector. These were from films made by Major Ross of the Sanitary Corps, and were here shown for the first time.

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Following this, Col. Victor C. Vaughan addressed the Association on "A Scientific Basis for the Greater Resistance of the Seasoned Soldier, as Compared with the Recruit, to Infectious Diseases," at the completion of which the meeting adjourned until 9.30 the following morning.

The fourth session opened with the report of the Nominating Committee:

For *President*, Lieut. Col. Joseph A. Hall, M. C., National Guard, Ohio.
For *First Vice-President*, Surgeon J. W. Kerr, U. S. P. H. S.
For *Second Vice-President*, Capt. Frank L. Pleadwell, M. C., U. S. N.
For *Third Vice-President*, Brig. General Francis A. Winter, M. C., U. S. A.
For *Secretary-Treasurer*, Col. James Robb Church, M. C., U. S. A.
For *Assistant Secretary*, Lieut. Col. Fielding H. Garrison, M. C., U. S. A.

The report of the Nominating Committee was unanimously accepted and the newly elected president addressed the meeting as follows:

Mr. President, gentlemen of the Association, it is needless for me to say how highly appreciative I am of this honor bestowed upon me, but I would be unmindful if I did not express what is in my heart; and in taking this honor to myself I am certain that it is but an expression of the Association towards that body of men in the profession who have aligned themselves, or who did align themselves in the great war with the National Guard. We have problems before us, many of them, which we will endeavor to answer by your assistance and your hearty, earnest and strong coöperation not only with myself but with the Executive Council. And I ask you for every assistance which I will from time to time call upon you to render not only to me—and I will need it—but for the welfare of the Association.

Col. John Van Rennselaer Hoff, U. S. Army, Retired, was then reëlected a member of the Sinking Fund Committee.

A paper entitled "The Military Aspect of Base Hospitals" was next read by Lieut. Col. Gustavus M. Blech, M. C., U. S. A., and discussed by Colonel Warner, Colonel Conkling and Commander Bainbridge.

Following this, Lieut. Col. Walter Fischel read a paper on "The Care of Six Hundred Cases of Penetrating Wounds of the Chest." This paper was discussed by Commander Bainbridge, General Griffith and Commander Sheehan.

The Auditing Committee reported that the report of the treasurer had been examined and found correct.

The Committee on Resolutions then introduced the following resolution which was read and accepted by the Association.

Resolution submitted by the Savings Division of the United States Treasury Department, Eighth Federal Reserve District to the Association of Military Surgeons of the United States at their convention held in Saint Louis, Missouri:

Whereas, the Treasury Department of the United States has inaugurated a national movement to induce greater thrift through the sale of Savings Stamps and Treasury Savings Certificates in an effort to increase the practice of consistent saving and national thrift.

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Whereas, it is acknowledged that thrift is essential to character formation and to the welfare of the American people at large, and necessary for the promotion of lasting prosperity.

***Resolved*, that The Association of Military Surgeons of the United States pledges its support and coöperation to the Secretary of the Treasury in the conduct of the campaign inaugurated under his direction to promote the sale of Savings Securities, Certificates of Indebtedness, and the transfers of Liberty Bonds and Victory Notes to private investors.**

Subsequent to this the newly elected officers were installed and escorted to the chairs by a committee composed of Brig. General S. C. Stanton, Capt. F. E. McCullough and Col. F. F. Russell. The incoming president was introduced by Colonel Birmingham with the following remarks: "Gentlemen, it is needless for me to say that Colonel Hall, who has been an old and tried officer of the Association of Military Surgeons and who is well known to you—it is needless for me to say how well qualified he is to conduct the affairs of the Association. It is a great pleasure indeed for me to have the honor of now presenting to you the new president, Colonel Hall."

Colonel Hall replied as follows: "Gentlemen, as this is a little bit out of order, I will not attempt to make any remarks at this time. Colonel Birmingham will continue throughout this meeting. I just hope that the efforts put forth in the past indicate what is going to happen next year, and we will push the society forward a little bit."

The other officers acknowledged their election and stated that they would defer their remarks to some future period. The Association then adjourned to meet at the Washington University Medical School.

At one o'clock the members of the Association were guests of the Washington University Medical School at luncheon in the refectory of the Medical School, where they were received and entertained by Dr. Robinson, the Dean of the Medical School, representing the faculty. About seventy-five sat down to luncheon, at the conclusion of which the fifth and last session was held in the auditorium of the Washington Medical School, at which time the following papers were read and discussed: "British Ambulance Trains" (illustrated), Capt. Frank L. Pleadwell, M. C., U. S. N.; "The Importance of Physical Therapy in Military and Civil Practice," Commander William Seaman Bainbridge, M. C., U. S. N. R. F.; "Observations on an Epidemic of Influenza in an Isolated Post of the A. E. F.," Maj. Alan M. Chesney, M. C., U. S. A.

It was voted by the Association that the next annual meeting should take place at New Orleans in April, 1920, the Thursday, Friday and Saturday preceding the meeting at that place of the American Medical Association.

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The following resolution was adopted by the Association, after which the meeting adjourned:

Whereas, the Association of Military Surgeons is appreciative in every way of the courtesy and consideration and the thoughtful arrangements made by the local committees in St. Louis for their comfort during the twenty-seventh annual meeting of the Association in that city; therefore be it

Resolved, that the thanks of The Association of Military Surgeons of the United States are hereby tendered to the committees, and through them to those in St. Louis who have done so much to make this meeting pleasant as well as profitable.

V. C. VAUGHAN,
HORACE M. BROWN,
F. E. MCCULLOUGH,
Committee.

The Henry S. Wellcome Prizes

Competition open to all medical officers and former medical officers of the Army, Navy, Public Health Service, Organized Militia, U. S. Volunteers, and of the Reserves of the United States.

***First Prize*—A Gold Medal and $300.**

***Second Prize*—A Silver Medal and $200.**

Competition for 1919 will be based on essays on prescribed subjects, as follows:

***First Prize*—"The Function of Medical and Surgical Consulting Staffs Determined by the Experiences of the Late War."**

***Second Prize*—"The Relation of Defective Mental and Nervous State to Military Efficiency."**

Each competitor must furnish five copies of his competitive essay. Essays must not be signed with the true name of the writer, but are to be identified by a nom de plume or distinctive device. They must be forwarded to the Secretary of The Association of Military Surgeons of the United States, Army Medical Museum, Washington, D. C., so as to arrive at a date not later than January 1, 1920, and be accompanied by a sealed envelope marked on the outside with the fictitious name or device assumed by the writer and inclosing his true name, title and address. Essays must not contain less than 5,000 or more than 20,000 words, exclusive of tables. Announcement of the prize winners will be made in a subsequent issue of the journal as soon as the decision of the Board of Award is made known. The winning essays become the property of The Association and will be published in THE MILITARY SURGEON. The writers of the essays receiving "first honorable mention" will be awarded life membership in The Association of Military Surgeons of the United States.

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EARLY EXPERIENCE IN THE WAR[1]

By Colonel JOSEPH A. BLAKE,
Medical Reserve Corps, United States Army

IT WAS my fortune, good or bad, to be in Paris when Germany started the great war. You are all familiar with the incidents which were staged to initiate war, but although I was cognizant of them all, I could not believe a prominent journalist who called me up the night before the declaration and told me it was on.

The first days of August were marked by the exodus of all my American friends and by the fact that one could not get a check cashed nor buy more than enough food for the current day's consumption; so strict were the orders and regulations to prevent hoarding and consequent shortage of supplies, which might in turn lead to revolution. Jaurez had just been assassinated, and the Government was uncertain as to the attitude the Socialists might assume.

I had no coal in my apartment and had to skirmish for it. I drove my automobile to a coal dealer whose yard was in a rather rough quarter, but could get no one to load the coal in the machine and so had to pile in two sacks in the back of the runabout. My experience was not over then, for in returning with the coal I was nearly stopped by women and men in the streets, who threatened me, on the ground that I was a foreigner using their coal and eating their food. I mention this as evidencing the distrust by the common people of all foreigners, Americans as well as others, at the beginning of the war. I believe the almost spontaneous demonstration of their sympathy by our people in relief and ambulance work not only made us popular but was a great help to the French Government in controlling the situation.

In the first weeks of the war the advantages of universal military service were even more evident than they were later. Not only was the large french army immediately available for advanced service but the older men took up their duties in the service of the rear with an aptitude and familiarity with military customs that enabled them to keep the army supplied and to check and throw back the German army in about six weeks from the outset of hostilities. This they did with what would seem to us an utter lack of material and, perhaps as important, with an erroneous conception of the methods of fighting that would have to be employed. The value and necessity for machine guns was at once recognized, and part of the automobile industry was

[1]Read at the stated meeting of the Academy of Medicine, of Northern New Jersey, October 15, 1919.

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organized to make mitrailleuses. If the French can be criticised for their conduct of the war, I should say that the chief criticism would be that they had not prepared a scheme for mobilization that would leave the men on the railroads and in the factories who were essential for their operation. Too many were called to arms, and the industry of the country was for a time at least almost completely crippled. Yet there were very few instances of round plugs put in square holes and remarkably little wasted effort.

If we compare the weeks at their disposal with the months or rather years, if we had had prevision, at ours, their accomplishment was indeed wonderful.

A great asset of the French was their personal resourcefulness, and far greater latitude was given to individuals than was ever given in our army. This was particularly true in medicine and surgery. An individual was put in charge of a hospital or service and was allowed to develop it largely according to his ideas. If they were unsuccessful or faulty, he was removed.

There was no consulting service comparable to ours. There were inspectors with the rank of *Medecin Inspector General* who made tours of the medical formations at the front, but all the hospitals of the interior, which correspond to our base hospitals, were under regional supervision by the inspector general of the region and his aids. There were, however, two or three special consultants, appointed by the minister from the surgeons of Paris, who visited the front periodically and reported to and advised the minister in regard to matters pertaining more particularly to the professional aspects of the care of the wounded. Later a commission was appointed, the *Commission Consultatif Superieur*, the duties of which were not only to consider and recommend improvements in the care of the wounded, but, in a certain measure, to attempt to standardize medical and surgical procedures. Yet the greatest latitude was given to the individual surgeon in regard to methods of treatment, and he was encouraged to develop new ones. The best of these methods and apparatus were selected and the apparatus or material to make it was furnished, upon requisition, to the hospitals. The minister, Justin Godard, also established a museum at the Val-de-Grace where these were on exhibition, as well as interesting pathological specimens and casts.

A short and partial résumé of the organization of the French *Service de Santé* may be of interest. It is a separate division of the War Department and is headed by an under-secretary, *The Sous-Secretaire d'Etat pour le Service de Santé*, who is addressed as *Monsieur le Ministre* and has a seat in the cabinet. Under him are several secretaries who

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are charged with the administration of sub-departments, one of which had to do with foreign charitable and aid organizations. All the formations organized by aliens and non-combatants were under this sub-department, which was very ably and courteously directed by Monsieur de Piessac. I shall not speak of the military organization of the Service de Santé except to say that the country was divided into a region of the advance, *Zone des Armeés*, and the rear, *Interieure*. The zone des armeés was divided up into regions for each army, each of which was more or less autonomous and had its own hospitals, the last being the H. O. E. (*Hopital Origin d'Etapes*), corresponding to our evacuation hospital. The *interieure*, consisting of the rest of France, was divided into regions each directed by a *Medecin Inspector General*.

One region, that of Paris (*Campe Retranché de Paris*), was more or less special in its organization, as it was sometimes in the zone of advance and sometimes in the rear.

In regard to the organization of the hospitals, each hospital was directed by an officer termed *medecin chef*, whose duties and authority were about the same as our commanding officers of hospitals. In all hospitals, military or benevolent, he is the responsible head of the institution as far as the *Service de Santé* is concerned. I may say here that all the hospitals founded and supported by contributions were termed *Hopitaux Benevoles*, literally translated "benevolent hospitals." For example, the Ambulance of the American Hospital of Paris was, if I remember rightly, *Hopital Benevole No. 2 Bis*, while the hospital I directed at Ris-Orangis was *Hopital Benevole V. R. 76*, the V. R. standing for region of Versailles; it being technically under the medecin chef of the military hospital there. To each hopital benevole was attached a detachment of enlisted men, corresponding to our hospital corps, under an officer of the rank of captain or lieutenant, who was termed the *gestionaire* of the hospital, and who was responsible under the medecin chef for all military records and expenses. The gestionaire was really the most important officer in these hospitals, for the medecin chef was dependent upon him and his good offices to make his life possible, since the paper work (*paperasse*) of the French hospitals, although far simpler and more complete than ours, is interminable. In addition, the French government supplied a large part of the medical and surgical supplies to nearly all the hopitaux benevoles or paid an agreed sum computed upon the number of hospital days. Unless the medecin chef had been relieved of the book and record keeping, he would have had no time for the care of the wounded. As it was, the office of the medecin chef, occupied as he was with the solicitation and acknowledgment of gifts from home and the management and discipline of the American staff as

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well as the wounded, was no sinecure; especially as many of the former had a light in their eyes for other things than the pure care of the latter.

For the first year of the war I was fortunate to be under dog in the American Ambulance and could devote all my time to the professional care of the wounded. Our early experience was indeed most depressing, and in many ways horrible. There were situations and conditions then which I never expected to see, and did not see again until our troops went into action. In the early days, as might be expected, transport of wounded was deficient and was destroyed by the advancing Germans; consequently, wounded were brought in in every imaginable condition. Some had had treatment; but at the time of the first battle of the Marne most of them were brought in without having been touched, or possibly with only a first-aid dressing. Not only that, but often days—sometimes a week or more had elapsed since the reception of their wounds. There were no transportation splints, with the exception of the Delorme gutter splints, and scarcely any of these. A fracture of the thigh would come in with a musket tied on to the leg. At the station of Villeneuve St. George, where our ambulances went to the wounded, Dr. Braithwaite, who had charge of them, told me that on one occasion he saw fourteen men die while he was filling his cars. They were lying between the tracks and without shelter.

I was the only surgeon in the ambulance, with the exception of Dr. Du Bouchet, who was the medecin chef and often away in the first days, and my sense of helplessness can be imagined. However, all the medical staff turned out to help me. Dr. Gros gave anesthetics and Dr. Magnin did the dressings in the wards. Dr. Turner, the obstetrician, helped Du Bouchet. After a few days I cabled one of my friends in New York for $6,000 and with that brought over some surgeons and a laboratory man. The wards were full of gas gangrene and tetanus. I had never seen such virulent tetanus. Usually the cases would die from six to nine hours from the onset. We managed to scrape together some antitoxin and I cabled Dr. Park for more. Finally antitoxin was supplied to the French army and its use made obligatory. We tried everything in the way of treatment without avail. I was amused one day by Dr. Delorme's visiting the hospital and describing the use of magnesium sulphate as a new treatment. I couldn't forbear telling him that I had used it in 1905 and published the results. He was much surprised. The Prince of Monaco came in and gave me a pamphlet reporting very favorable results by the injection of carbolic acid. But, as I could see, it had been used in what we would call favorable cases. Gas gangrene was terrible but no worse than observed among our wounded in whose case

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the same things had occurred; namely, lack of proper operations and delay in transport.

The notable event of that year was the discovery by Dr. Kenneth Taylor, then pathologist and director of the laboratory of the American Ambulance, of the pathogenesis of gas gangrene. Although elaborated later, his theory and description of the disease was the first which enabled us to develop a rational treatment of the disease, namely, the excision of devitalized and infected muscle tissue.

But I believe, the most distressing and disheartening of our early experiences was our inability to treat gunshot fractures with any semblance of success. We were handicapped by the old and prevalent ideas as to the treatment of fractures, first and paramount of which was the necessity for fixation not only of the fracture but of the adjacent articulations. As I have stated before in other communications, I believe that the greatest and most valuable advance made in surgery during the war was in the treatment of fractures. Hedged in and stultified by the old precepts, we attempted to fix these fractures in plaster and splints, only to find that the limbs would rot in the casts or that the casts would become so loose as to afford no immobilization. I used traction at first and then began to hang up or suspend fractured limbs so as to overcome swelling and permit access to the wounds. Gradually the present system, that was used by our army and extensively adopted by the French army and by the municipal hospitals of Paris, was evolved. Ideas and details were procured from many sources, notably British; and at the present time, or at least last winter, the further we departed from the old principles of immobilization the better were our results. It will suffice to say that in our later cases every joint was in motion throughout treatment, even in fractures of the femur, and the patients retained complete function of their limbs and could use them normally as soon as their fractures were consolidated.

In the fall of 1915 I was called to take charge of the hospital at Ris-Orangis founded by Lady Johnston and Mr. Reckitt, the *Hopital Benevole V. R.* 76 already referred to. This hospital was organized under the Anglo-French department of the British Red Cross. The lay staff and orderlies were British; the physicians and trained nurses chiefly American. There were several English ladies serving as V. A. D.'s and I cannot speak too highly of their devotion and willingness to comply with the American ideas of the professional staff. My service there was in many ways ideal. The hospital, a converted monastery, was admirably arranged and supplied with water, gas and electricity. It contained a little over two hundred beds and had its own ambulance service. Shortly after I went there the Service de Santé designated the hospital

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a surgical center (Centre Chirugicale) and a number of outlying hospitals in the region were attached to it as secondary hospitals, to which we could evacuate our wounded as soon as they were convalescent and where we could follow them and bring them back to Ris-Orangis in case they needed later operations. The wounded were brought in the hospital trains to Villeneuve St. George, 14 kilometers away, where our ambulances met them and distributed them to all the hospitals of the region. The fracture and severe cases were brought to Ris-Orangis, so that we always had an active interesting service except in the winter months when warfare was practically at a standstill.

The Robert Walton Goelet Research Laboratory, which Dr. Kenneth Taylor and I organized at the American Ambulance, naturally followed us to Ris-Orangis. Dr. Taylor continued his work on gas gangrene and made a number of interesting and valuable observations on the anaerobic infections, one of which was the persistence of bacteria in the interior of dead fragments of bone. Sequestra, as they are generally called, could be soaked for hours in the strongest antiseptics, after which cultures of tetanus and other bacteria could be obtained from their interior. This observation throws some light on the occurrence of late tetanus. We also carried out an extensive series of comparisons between the different methods of wound treatment, chiefly pitting the Carrel-Dakin against other methods. The results of our investigations led us to the conclusion that no one treatment was a panacea, but that a judicious selection or combination was the more successful. In fact, I am convinced that the only treatment for wounds that can be said to approach a panacea is direct sunlight.

Our X-ray plant at Ris-Orangis was the best and most stimulating that I have ever known. We were extremely fortunate in that we had Mr. Gage in charge. He was an Englishman, rejected on account of his health by the army, but who did, I believe, as valuable and as much work as any one in the R. A. M. C. He was a born investigator and an excellent physicist, always inventing and improving upon current methods. His method of localization is, I think, the most accurate, simple and practical of any that I have known. His work was so appreciated by the consulting staff of the British army that they did their best to further his endeavor to be accepted by the army, but without success. But if he had been accepted, such is the glorious efficiency of all armies, he probably would have been assigned to a labor battalion instead of the position of consulting radiologist which they desired for him.

During my service in Ris-Orangis I made an attempt to introduce the half Thomas leg splint as a transport splint for the evacuation of

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the wounded from the battlefield. I had one hundred made and sent up to the front to be used in the *Postes de Secours*. Some favorable reports came back to the *Service de Santé*, but owing to lack of personal demonstration they were not received with universal favor. Later the splint, improved by Colonel Keller so that the half-ring could be folded, thus making it adaptable to either right or left extremity and more easily transportable, was of valuable aid in transporting our wounded from where they actually fell on the battlefield.

Eighteen most interesting and satisfactory months were spent at Ris-Orangis, during which progress was made in the methods of treatment of fractures and a great deal of experience in the treatment of bone sinuses obtained. In regard to the latter I found that it was perfectly possible to cure them at a single operation. However, to be successful it was imperative to remove all the dead fragments of bone. This can be readily done by first localizing them by means of stereoscopic X-ray plates. They should be removed with care not to injure the growing bone more than absolutely necessary and to leave the cavities so that they can become obliterated. We never curetted sinuses blindly and, in fact, did not disturb the granulations more than we could help.

I left Ris-Orangis just before we entered the war to organize the American Red Cross Hospital of Paris, which at first was devoted to French wounded but later became attached to our army as the American Red Cross Military Hospital No. 2.

During the early years of the war I did not get to the French fronts. It was practically impossible unless on a joy ride obtained by influence, and I hesitated to ask permission, realizing what an inconvenience visitors there were. I visited the British front in 1915 and inspected some of the clearing stations and advance aid posts. The work in some of the latter interested me greatly. They were situated for the most part in buildings which had up to that time escaped the shells. I remember one in a church and another in a laundry. They were in charge of young men, some of whom were amply justified by their results in the pride with which they showed their cases. Most of these were gunshot wounds of the abdomen. One surgeon was draining his cases by putting a tube through a supra-pubic incision and then sitting them up in bed. Nearly all his cases were dying. At another post a surgeon was sewing up the abdomen without drainage, and nearly all his patients were recovering. I suggested to the consulting surgeon that he ask the first man to follow the second's example, but he felt it was better to let them work it out themselves and not give too many orders. On the whole they were obtaining excellent results, considering the meagerness of equipment and the fact that they were in range and might be hit by a shell at

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any moment. Later in the war I visited an elaborate underground French post for non-transportables which was situated just behind the trenches. This contained about 70 beds, and was lighted by electricity and protected from gas. It contained very few patients.

The outstanding feature of the British, and more particularly the French hospitals was the economy in material and personnel. In a French barrack holding thirty beds there would be only one nurse and a couple of orderlies. Yet the wards were almost always neat and the patients clean. I have gone through barrack after barrack in an H. O. E. and seen the clothes turned down, and the beds were invariably clean. The grounds of these hospitals, even close to the front, were neat and usually planted with flowers or vegetables.

My relations with the Service de Santé were always most pleasant. I came to know many of the officers almost intimately. My superior officers were always most courteous. I was always informed of the inspector general's visit at least two or three hours before he arrived. He inspected the hospital about once a month and went over every inch of it and examined every patient. Such an inspection would take about three hours.

The medecin inspector general for Paris used to reach his office about 7.30 a. m., remain there an hour, and then go on inspection or other business, returning at 5.30 p. m. and remaining in his office usually until after 7.30 p. m. His office in the Lycee Buffon was quiet and most orderly. A single private acted as usher and messenger, and one hardly ever had to wait if one had an appointment. Usually there would be a row of officers with four or five "galons" (commandants or colonels) waiting for an audience.

There were about 50,000 beds for wounded in Paris, scattered through many hospitals, many of which were hopitaux benevoles and consequently troublesome.

Under the inspector general were several subdepartments, each headed by a colonel. Among them may be mentioned personnel, drugs and supplies, X-rays, laundry, coal, buildings, and a legal department. When I had to see the general about a hospital matter, the head of the department concerned would be called in, and we three would talk it over together and quickly arrive at a conclusion.

Before closing I must say a word in regard to may impressions of the French surgeons. As I have already said, they were given a great deal of latitude and had ample opportunity to demonstrate their ability and originality. They were usually attached to a formation or hospital for long periods, and so took pride in developing the institution as well as in their own particular work. One fault of the French hospital situation in

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the interior was that there were too many small hospitals. This arose from the fact that they had to use what buildings were available, and these were frequently small and ill adapted to the purpose. This gave rise to many criticisms, both as to the personnel and the buildings, for it was impossible to find enough surgeons to provide good ones for them all. The hospitals in the zone des armees were usually built up of barracks and were often quite large, containing over 3,000 beds. The best surgeons were attached to these, and in them one saw the very best surgery—in fact, remarkable surgery. With the exception of their apparatus for treating fractures, I believe they were far ahead of the surgeons of any other army. The trouble with their fracture apparatus was that it was too diverse. While excellent results were obtained if the patients remained in the same hospital throughout their treatment, if they were evacuated during treatment they were apt to fall into the hands of surgeons unfamiliar with the apparatus.

Some of the apparatus was quite complicated and required a great deal of skill to apply it. It may be said that it is not the fault of the apparatus but of the surgeons. This is true, but we are faced with the impossibility of obtaining sufficiently able and skilled surgeons and must therefore often discard the ideal in military surgery and adopt a treatment that can be satisfactorily administered by the average surgeon. An instance of this is the treatment of gunshot fractures by complete resection of the fractured area. In the hands of some of the French surgeons who advocated it, very remarkable results were obtained both in regard to anatomical repair and to restitution of function. Many other surgeons who saw their work and results undertook resection, but, either not having sufficient skill or from ignoring essential details of the technique, obtained results which were disastrous. Consequently, resection of fractures, although an excellent treatment in the hands of an adept like Leriche, had to be forbidden. In the same way primary suture of wounds, although Lemaitre obtained 98 per cent of successes, had to be discountenanced in our army. Of course the French surgeons had the great advantages of a longer experience in military surgery, but on the other hand we have to acknowledge that their fundamental education is better than ours. It is estimated that young men in both France and England are two years in advance of our youths in regard to general education; and from my experience among them I feel sure that their physicians are better grounded in anatomy, physiology and chemistry. In military surgery, not only a knowledge but a familiarity with the anatomy of body and extremities is essential. Our men did not possess this knowledge. Our surgeons, particularly in the large cities, neglect traumatic surgery and devote themselves too exclusively to

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abdominal surgery. Although we all hope and pray that there may never be another great war, our desire must not prevent us from being prepared. God forbid that in the next war we make such an exhibition of unpreparedness as we did in this. We must not forget that we—I mean the American nation—were responsible for thousands of needless deaths, and we must not permit this to be repeated in the wars to come. For there will be wars, league or no league. How can we prevent its being repeated? I believe that the answer is in universal military service, which will not only educate, improve physically, instil patriotism and teach our young men how to take care of themselves when campaigning, but will develop a staff of officers capable of commanding, and, what interests us chiefly, caring for their men as well. The Medical Reserve Corps should be better organized; its personnel should be called to service for at least a few weeks every year and trained in army routine and military medicine and surgery. Indian warfare is a thing of the past, and, with the exception of what is necessary to protect our borders, our army stations should be situated at our great industrial centers. I should favor the mass of traumatic surgical material, so large in these centers, being turned into the army hospitals, so that the surgeons in the Regular Army might gain experience in this type of surgery.

The Regular Army should no longer contain all the administrative ability nor the Reserve Corps all the professional skill. Better and more intimate relations should be established between the two branches. This will come about when the Army and Navy Medical Corps become more prominent participants in the scientific discussions of our medical associations, and when we assume our obligations to the arms of our Government, which assure the safety and prestige of our nation.

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SOME OF THE EARLY PROBLEMS OF THE MEDICAL DEPARTMENT, A. E. F.[1]

By Colonel SANFORD H. WADHAMS and Colonel ARNOLD D. TUTTLE
Medical Corps, United States Army

(With two illustrations)

THE U. S. ENTERS THE WAR

AT THE time the U. S. declared war on Germany the Army was in the midst of a reorganization period created by the passage of the National Defense Act of 1916. The painstaking care and precision with which this change was being carried out immediately became supplanted by a vigorous policy that aimed at cutting corners, red tape, and a few other things which a view to getting quick results. The entire country was awake. Important events were daily occurrences.

Barely had we assumed a belligerent status than the British, sorely pressed for medical help, called upon the American Government to send to their aid such medical officers and hospital units as could be spared them in the emergency. To meet this call, and on very short notice, six of the base hospital units that had been organized as a preparedness measure by the American Red Cross under the direction of Col. (later Brig. General) J. R. Kean, Medical Corps, were mobilized and mustered in as U. S. Army units and dispatched overseas for duty with the British Expeditionary Forces in France. These base hospital units were the first organized forces of the U. S. Army to be sent to Europe. To Base Hospital No. 4, U. S. Army, organized at Lakeside Hospital, Cleveland, Ohio, and sailing from New York on May 8, 1917, fell the honor of being "First in Europe." The unit was commanded by Maj. H. L. Gilchrist, M. C., U. S. A., the chief of the professional staff was Maj. George W. Crile, M. O. R. C., U. S. A., and the adjutant, Capt. A. D. Tuttle, M. C., U. S. A. For a moment let us digress. These six base hospital units served continuously with the B. E. F. When the A. E. F. began to organize large hospital centers in the spring of 1918 it was planned, and the British accordingly notified, to call in these experienced units for service with the A. E. F., replacing them if necessary by fresh units from the United States. Campaign conditions rendered this impracticable both from British and American viewpoints. Due to frequent exchanges, however, a large number of the personnel gradually joined the A. E. F. in important administrative and professional capacities, and throughout our combat activities exercised a

[1]Read at Annual Meeting, St. Louis, Mo., October 13-15, 1919.

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beneficial influence in the shaping and furthering of policies for the Medical Department. The majority of our mobile hospitals, which occupied so important a rôle in our hospitalization service at the front, particularly during the Meuse-Argonne operations, were organized with personnel from these units.

But to resume. No sooner had the base hospital units for the British left our shores than steps were taken to send General Pershing, with a small force, to France. In his General Orders No. 1, dated at Washington, D. C., on May 26, 1917, he assumed the duties of Commander-in-Chief, and, in announcing his staff, virtually ushered in the birth of the A. E. F. In launching our overseas effort, General Pershing in one of his reports relates:

> I selected a small staff and proceeded to Europe in order to become familiar with conditions at the earliest possible moment. . . . It was necessary to plan for an American force adequate to turn the scale in favor of the Allies. . . . The immensity of the problem which confronted us could hardly be overestimated. . . . The first requisite being an *organization* (italics ours) that could give intelligent direction to effort and the formation of a staff occupied my early attention.

In this project the Medical Department was vitally concerned.

AMERICAN MILITARY MISSION IN FRANCE

Prior to the entrance of the United States into the war seven officers of the Army had been detailed to duty in France as military observers. Two of these officers were from the Medical Corps, Colonels James R. Church and Sanford H. Wadhams. In the latter part of 1916, and pursuant to authority granted by the War Department, this group of officers was organized as a military mission accredited to the French army. Up to the time of the diplomatic break between the United States and Germany it had been impossible for this mission to accomplish much in the way of tangible results. The reasons for this may be stated as:

1. Disinclination of the French to permit Americans to see or know much of what was going on. This was natural, as the French were not at all sure at that time where the sympathies of the United States *Government* lay.

2. The impossibility of utilizing at home such data as were obtained and forwarded by the mission in the form of reports.

After the rupture of diplomatic relations in 1917 the first difficulty disappeared at once. Every facility was extended the mission for observation of military activities. A mass of priceless data was gathered and forwarded to the War Department at Washington. The personnel available in the Intelligence Section of the General Staff at that time was so limited that little or no use could be made of this material.

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One particular report on the Gas Service of the French army is recalled. This report was prepared by two members of the mission after they had been permitted by the French Minister of War to take the complete course of instruction at the French Gas School. It was a voluminous report, covering most confidential matters, and went into the chemistry of the gases employed, their manufacture, tactical use of gas and gas shells, and the defense against gas. The organization of the Gas Service of both the French and German armies was given. Just what use was made of these important data has never become apparent.

Following the declaration of war on April 6, 1917, the American War Department made many demands on the mission, through the military attaché, for specific information. In order to facilitate procuring this information, the French Minister of War detailed several general staff officers to assist the officers of the mission in preparing surveys of ports, condition and capacity of railroads, location of training camps, etc. Among these officers was M. le Medicin Principal de Premiere Classe (Colonel) Castelli of the Medical Department of the French army. This officer was a man of keen judgment and wide vision. In addition he understood Americans and the American temperament. As a representative of the French Minister of War he had been given broad powers to act. It was a most fortunate selection for the future of the Medical Department, A. E. F.

One of the first duties of the mission in the early spring of 1917 was a careful examination of all the ports on the west coast of France. This important question was studied by members of the mission and the French officers referred to in as much detail as the available time would permit. Interesting as a discussion of this important matter which determined the avenues through which streams of Americans were soon to be pouring into France would prove, it does not belong here. Suffice it to say that for various reasons it was decided that the first troops should be debarked at St. Nazaire. There the French were requested to build a barrack camp to shelter about 20,000 men, which at that time was the strength of an American division. At this point commenced the problems of the American Medical Department in France. The water supply available at St. Nazaire was not sufficient for this number of troops, at least according to the standards to which Americans were accustomed. This deficiency was temporarily overcome by placing water boats in service on the Loire to carry water from points miles inland. This matter settled, the French moved in large numbers of labor troops, harvested such of the growing crops as were sufficiently matured, and began the erection of the large number of huts required and the installation of a camp water system. Sick

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had to be provided for and the plan of the camp called for a 300-bed camp hospital, for which the double-wall barrack was to be furnished. After the camp construction was well along, word was received that the numerical strength of the American division had been increased and in order to shelter the additional men it would be necessary to utilize the barracks intended for the hospital. In this emergency the French were appealed to, and the only French military hospital in St. Nazaire was at once surrendered to the Americans. At this time it had a capacity of 250 beds, which, it was realized, was entirely inadequte. Consequently the French, through Colonel Castelli, turned over the 500-bed military hospital at Savenay, only a few miles inland, and also made arrangements to surrender a 500-bed hospital at Nantes. At the same time tentative arrangements were made with the French to take over several other hospitals, notably one of 1,100 beds at Bordeaux. However, as no personnel had yet arrived in France, these arrangements were held in abeyance until such time as the Commander-in-Chief of the Expeditionary Forces should arrive.

After the debarkation camp at St. Nazaire was started a study of the railroad system and inspections of temporary supply depots were made. This was followed by an extended trip towards the front with the object of selecting possible training areas for the use of the first American contingent. All of these surveys and inspections were made by officers of the American Military Mission, accompanied by officers of the French General Staff. The primary object was to avoid delay when American troops should begin to arrive. It was tentatively settled that the first division to arrive should go into the training area around Gondrecourt. At this place a small barrack hospital was taken over from the French and immediate steps instituted to increase its capacity to 300 beds. The French began the erection of the necessary additional barracks, evacuated their patients and reëquipped the hospital with new material throughout. The latter was necessary, as it was realized that our own medical supplies would not be immediately available.

The above furnishes a very hasty glimpse of the situation on June 13, 1917, when General Pershing and his small staff arrived in Paris, where the mission had selected a temporary headquarters for the A. E. F.

ORGANIZATION AND GENERAL STAFF ACTIVITIES

The first headquarters of the A. E. F. were located in a small residential building in the Rue Constantine, Paris. The Chief Surgeon's Office comprised three small rooms. Col. A. E. Bradley (later Brigadier

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General), the chief surgeon, had been on duty in England as military observer prior to our entry into the war and had joined General Pershing upon his arrival there. With the general's party were also Col. M. W. Ireland, Maj. George Peed, Capt. J. R. Mount and Capt. Henry Beeuwkes of the Army Medical Corps. These officers, with Leiutenant Colonels Church and Wadhams, assembled in Paris to assist the chief surgeon during the developmental period. Thus at the beginning there were seven medical officers and about twice that number of clerks available to take up and solve the intricate problems with which we were confronted in those early days. Conferences were held daily with the A. E. F. Staff and frequently with the French.

After the arrival of the First Division and considerable casual personnel, the work had so multiplied that the office space at Rue Constantine became overtaxed. This necessitated a move by the medical and some of the other special departments to more commodious quarters in the old Hotel St. Anne. In this initial move of the Chief Surgeon's Office one small truck could have carried all our records and clerical material in the way of typewriters, desks, chairs, etc. In marked contrast to this we might add that the last move made by the Chief Surgeon's Office—Chaumont to Tours—involved the transportation of approximately thirty officers, one hundred and twenty-five clerks, and six box cars of records and other paraphernalia, practically one complete railroad train.

Shortly following the establishment of offices in the Rue St. Anne a number of casual medical officers arrived and were assigned to various duties. In the Chief Surgeon's Office, however, no specific designation of duty had as yet been made. Nearly all of the work arising at that time concerned questions of policy which had to be decided by conferences among the few officers then serving in the office.

As soon as troops in increasing numbers began to arrive, routine reports filtering into the Chief Surgeon's Office necessitated a division of office duties in order that the diversity of pressing work should be more expeditiously handled.

Coincident with the arrival of the First Division in its training area up in the foothills of the Vosges arose a necessity for the organization of lines of communication. The geographical limits of the L. O. C. as prescribed extended from the sea to the point where delivery of supplies was to be made to the field transportation of the combat forces. Headquarters of the L. O. C., while undergoing organization, was announced as Paris. The L. O. C. was subdivided into three base sections, an intermediate and an advance section. Col. (later Brigadier General) F. A. Winter, Medical Corps, recently arrived, was appointed chief surgeon of

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the L. O. C. To place the force of the Chief Surgeon's Office of both General Headquarters and L. O. C. on an efficient footing required additional officers.

As above stated, the first arrivals in France had been six base hospital units for duty with the British. The commanding officers and adjutants of those units were officers of the Regular Army Medical Corps. The Chief Surgeon transferred these six adjutants to Paris to assist him and his small force in perfecting an organization for the Medical Department of the A. E. F. Four of them were assigned to Colonel Winter to assist in building up the L. O. C. activities.

Following their arrival the apportionment of duties in Colonel Bradley's office at C. S. O., General Headquarters, were as follows: Colonel Ireland as executive; Colonel Wadhams (Major Tuttle assisting) handling hospitalization, Franco-American liaison, and general estimates on personnel and equipment; Major Beeuwkes, attending surgeon; Major Harmon, sanitation and sick and wounded; Colonel Church, chemical warfare; and Major Mount, medical supplies. Considerable creative or constructive work was accomplished in the few rooms occupied by us at the Hotel St. Anne. Some of our more important policies were developed and adopted in that establishment.

The selection of Chaumont, in the department of the Haute Marne, as the future General Headquarters of the A. E. F. was decided upon during the latter part of August, and September 1 witnessed our transfer from metropolitan comforts to provincial discomforts. Here, again, the packing of records and office equipment involved no serious burden. It was at Chaumont in the fall of 1917 that some of our weighty problems arose and were successfully solved. The need for a large increase in the personnel of the C. S. O. for the work soon to be at hand was so manifest by this time that our allotment of office space in the old French caserne at Chaumont was many times that which we had just vacated in Paris.

About this time the Chief Surgeon's Office of the L. O. C. was also having its troubles, but under the guidance of Colonel Winter soon got into operation a systematized method of carrying on business and establishing sanitary formations over the gradually expanding territory. To both the offices were added from time to time additional officers and a correspondingly larger force of clerks.

Base hospital and other units arriving had to be suitably located. With the movement of every American unit to a new location arrangements must be made with the French for the care or evacuation of the American sick. Considerable casual personnel were constantly arriving, with the necessity for suitably classifying and assigning them to appropriate duties.

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This work required very close coöperation of all departments at G. H. Q., and it was soon realized that only through centralized control could we get the quick results so frequently demanded by the changing conditions. Careful studies as to future needs were being made, and, after submission to the General Staff for approval, they were relayed to the U. S. by cable. In that fall and winter of 1917 the cable lines were taxed to capacity.

In February, 1918, the Commander-in-Chief, in G. O. 31, radically modified the scheme of organization for A. E. F. Staff as published in G. O. 8, 1917. We soon began to allude to this as the "new era" of our activities abroad. In carrying into effect the provisions of this order the General Staff at General Headquarters was divided into five sections. The derivation of the "G" abbreviation for these sections must be told at another time. The head of each section was known as an Assistant Chief of Staff. Between him and the Commander-in-Chief there were a Deputy Chief of Staff, and a Chief of Staff. Briefly, the First Section of the General Staff, or G-1, the term commonly used, supervised ocean tonnage, requisitions, replacements, welfare work, etc.; G-2, information concerning the enemy, secret service, topography, censorship and intelligence; G-3, strategic studies and plans and combat operations of the troops; G-4, supplies, construction, transportation, hospitalization and evacuation of the sick and wounded, and assignment of all new units arriving in France; G-5, instruction and training. This was the arrangement of the General Staff at G. H. Q. The reorganization order also directe l that the distribution of staff duties in division, corps, armies and other commands conform in principle to the above-mentioned distribution. The order further provided that the Lines of Communication (L. O. C.) as reorganized would be known and designated as the "Services of Supply" (S. O. S.) G. O. 31 had a very important bearing on the future organization and operations of the Medical Department. Along with other chiefs of the administrative and technical services the Chief Surgeon, who at that time was Gen. A. E. Bradley, was separated from General Headquarters and directed to establish his office at the headquarters of the commanding general, S. O. S., then at Tours. The chief of each of these services so divorced from G. H. Q. was authorized in his discretion to designate an officer of his service to represent him with each general staff section at General Headquarters. The Chiefs of Services still remained members of the staff of the Commander in Chief and were also directed to so organize their offices that the efficiency of their departments would not be impaired by absences for conferences or other duties assigned them by the Commander-in-Chief. In other words, while their headquarters were at Tours, they were author-

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ized and expected to travel throughout the A. E. F. to check up on, direct and supervise the work of all units of their services. This of course included combat units.

To represent him at G. H. Q., the Chief Surgeon, when he moved to Tours, left behind Col. S. H. Wadhams as his deputy, Colonels P. C. Hutton and A. D. Tuttle with G-4, Col. M. W. Shockley with G-5 and Col. A. P. Clark with G-1. With this separation of the Chief Surgeon from General Headquarters, A. E. F., his relations with the combat forces necessarily became more remote; and as his deputy the senior medical officer with G-4, as being in immediate touch with all combat troops, carried out his policies and supervised the medical department activities in the zone of the Army. Nearly all the medical activities at General Headquarters gradually began to be concentrated under one group in G-4,designated as G-4 B, and later quite commonly known as the "medical section G-4 of the General Staff." The demands upon this medical group of G-4 constantly grew, and from the beginning of our A. E. F. combat activities it was called upon to meet the daily emergencies of battle conditions as they arose. G-4, G. H. Q., with which section of the General Staff Medical Department activities became more closely identified, prescribed policies; the S. O. S. or other agencies executed them. With the growth of the medical group attached to G-4 it soon became the center to which matters arising at or referred to G. H. Q. and affecting the Medical Department were referred for recommendation or suitable action. It is needless to add that recommendations made as to establishment of policies or actions taken by this medical section G-4 were invariably first submitted to the Chief Surgeon for his approval. In this manner it was made possible for this medical section at G. H. Q. to actually represent the Chief Surgeon. Of course all actions initiated in the group were executed over the signature of the Assistant Chief of Staff, G-4. Aside from the many questions which arose and involved hospitalization and evacuation policies in the S. O. S., most of the time of the medical group was taken up with questions concerning operations and policies connected with combat activities at the front. The Chief of Section kept the members of the medical group informed as to impending combat plans, and through advance notice so furnished, the medical group was able to keep in touch with the chief surgeons of the various armies, corps, and divisions concerned as to their facilities for meeting forthcoming obligations. Prior to the creation of A. E. F. army and corps formations there devolved upon this group the necessity of functioning in the dual capacity of an army or corps surgeon, as there was at that time no other agency through which the higher coördinative functions could be exercised. This of course was not contem-

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plated in the reorganization of the General Staff, but through force of necessity it became a duty which was and could be discharged in no other way. Even during the height of our activities the chief of the medical group virtually functioned in the rôle of a chief surgeon of a group of armies. Shortly after the reorganization scheme became effective Colonels, Shockley, Wadhams, Tuttle, and Clark were detailed as members of the General Staff, A. E. F. (Colonel Hutton had been sent to the Chateau Thierry region to take charge of Medical Department activities there, being designated as Chief Surgeon of the Paris Group.) As a result of his appointment as a general staff officer, Colonel Wadhams became Chief of the Medical Group of G-4, and directly under the control of the Assistant Chief of Staff of that section. However, he still continued to represent the Chief Surgeon at Tours and through custom gradually became known—at G. H. Q. at least—as the Deputy of the Chief Surgeon.

The geographical location of G. H. Q. permitted of maintaining close and immediate contact with Division, Corps, and Army Headquarters. It was not only possible for a member of this group to rapidly reach almost any part of the front occupied by American troops, but a splendid system of telephone and telegraph communication enabled the office to know exactly the conditions to be met at any and all times. It was due largely to this fact that the Medical Department was able to meet the daily problems created by the lack of authorized personnel, sanitary units, and equipment. By means of this rapid system of communication, casual personnel, operating teams, and sanitary units (ambulance companies, field, evacuation and mobile hospitals) were moved on orders initiated by this group from one sector of the front to another. Without this macinery for coördination of effort and consolidation of resources, evacuation, and hospitalization of battle casualties would with the limited personnel have been well-nigh impossible.

A discussion of the principles of Medical Department representation on the General Staff as conceived and carried out in the A. E. F. must be reserved for another article. Suffice it to say, however, that the organization at G. H. Q. as tested by the actual experience of war under trying circumstances, was highly satisfactory. It is not believed that a more efficient organization or one better calculated to meet the emergencies as we saw them could have been devised. This expression of opinion should, however, be qualified by the statement that without the sympathy, broad judgment, and good common-sense of the Chief of G-4 and the constant assistance furnished by his wide knowledge of military problems and organization, the verdict might well have been different. In other words, efficient results can only be expected when

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the A. C. S. of G-4 is willing to consider the medical members of his section as part of his official family and worthy to be entrusted with his full confidence. Under such conditions the Medical Department is infinitely better prepared to discharge its responsibilities, either in peace or war, than has heretofore been the case. Lacking such conditions, failure can be confidently predicted. We feel that to Brig. Gen. George Van Horn Moseley, U. S. A., the A. C. S. of G-4 under whom the organization of the Medical Group at G. H. Q. was perfected and functioned, the Medical Department, including our battle casualties and sick, owes an eternal debt of gratitude. Entertaining the highest regard for the medical profession, he uniformly recognized it as an essential element of the military machine and gave it constant support and every opportunity to make good.

FRANCO-AMERICAN LIAISON

From the beginning it was realized that the medical services of the French army and the American Expeditionary Forces must necessarily work in the closest harmony and with a high degree of coöperation. To secure effective unity of action it was essential that the organization of the French Medical Department, from the Office of the Under Secretary at the Ministry of War in Paris up to the field sanitary formations, should be clearly understood. Without such understanding, coördination would not be possible. As time went on this necessity became more and more apparent. In developing a hospitalization program for the American Expeditionary Forces it was necessary to work in close association with the French. As American troops began to arrive in increasing numbers and to go into line in comparatively small units mixed in with French troops, the two services were brought into closer and closer relation, and finally, when in March, 1918, the exigencies of the situation caused the Commander-in-Chief to place the available American divisions at the disposal of the French High Command, the two services had to function as one.

The French realized this necessity of intimate coöperation even more vividly than did we of the American Expeditionary Forces. As has been stated above, an experienced medical officer, Colonel Castelli, had been selected by the Minister of War to handle all matters affecting the relations of the two medical services. Very shortly after the arrival of the first American troops the Under Secretary for the Medical Service established a sub-section in his office known as the Franco-American Section. This provided an agency through which all matters affecting the two services could be studied and handled. Owing to the shortage of medical officers the Chief Surgeon, American Expedi-

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tionary Forces, was not able to place one of his officers in this Franco-American Section, as the French desired, but he did designate Col. S. H. Wadhams to act as liaison officer between the two. The next development of this working plan consisted in the establishment of a Franco-American Section at the headquarters of each of the military regions into which France is divided. A medical officer of the American Expeditionary Forces, in addition to his other duties, was designated as liaison officer between the Regional or Departmental Franco-American Section and the Chief Surgeon. As the great problems at this time were supply and hospitalization, and concerned almost exclusively the Zone of the Interior as differentiated from the Zone of the Army, this plan worked very satisfactorily. All questions of policy were decided between the Franco-American Section in Paris and the Chief Surgeon's Office, American Expeditionary Forces. With policies once determined the actual details were carried out by the regional sub-sections.

With the transfer of General Headquarters, American Expeditionary Forces, to Chaumont arose the necessity for a new agency for the transaction of business concerning the French and Americans. Chaumont was in the Zone of the Armies, and with the arrival of more and more American troops the number of questions which had to be decided between the two headquarters rapidly increased. The French High Command therefore established at Chaumont a French military mission which was organized with the same divisions or bureaus as the French General Staff. This organization provided a medical section in charge of Medicin Major de Premiere Class (Major) Mortier. All questions, of whatsoever nature, affecting the medical services in the Zone of the Army were handled through his office. The value of this organization and of the services of this officer cannot be overestimated.

From the beginning the French placed great stress on liaison and provided liaison officers for every branch of endeavor. Many Americans were at first frankly indisposed to meet them half-way in this respect. Then, too, the shortage of the necessary officers with the special qualifications required was no small obstacle. As time went on, however, and it was realized that "liaison" meant coördination of effort and that the liaison officer was primarily a coördinator, this prejudice disappeared.

For the Medical Department, upon the recommendation of the Chief Surgeon, the Commander-in-Chief designated one of the writers to act as the liaison officer with the office of the Under Secretary for the Medical Service at the Ministry of War in Paris, and the same officer occupied the same position with regard to the French military

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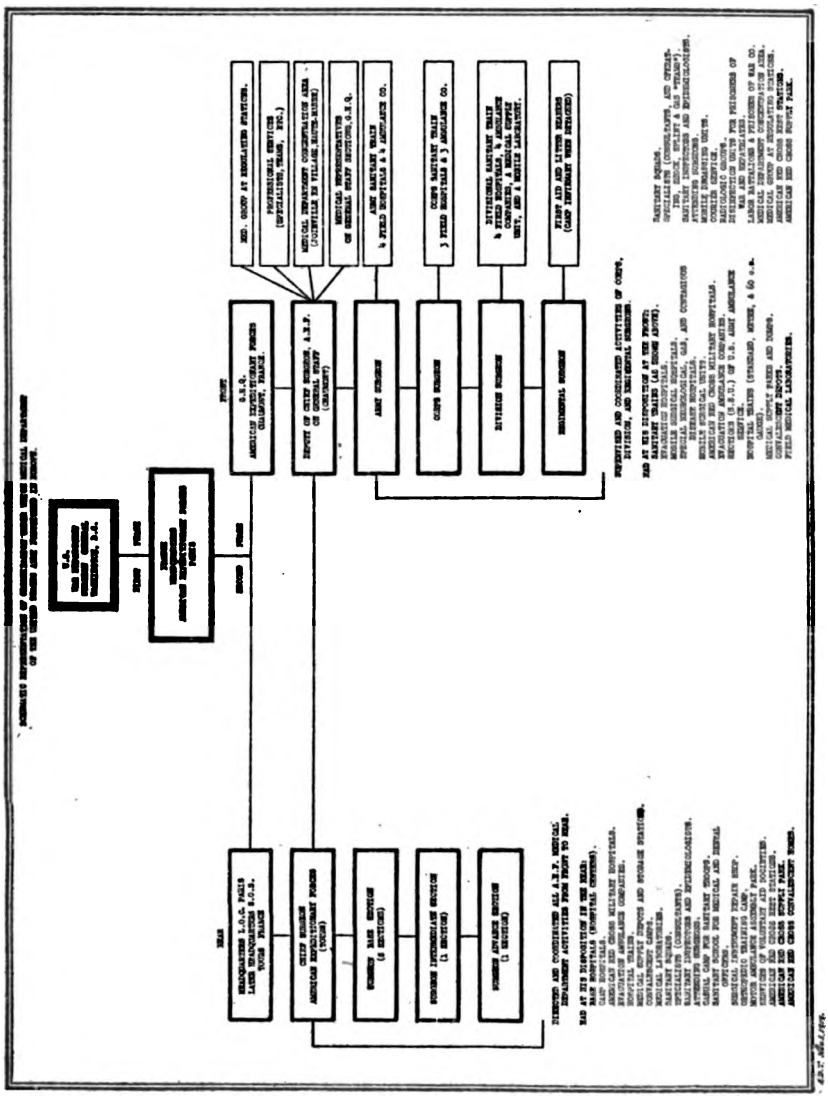
mission at General Headquarters. This officer also had charge of the Hospitalization Division in the Office of the Chief Surgeon, American Expeditionary Forces. While this arrangement placed too heavy a



burden on one man, because of the shortage of medical officers it was the only solution possible. As a matter of fact the arrangement worked out well for the reason that the great majority of questions which required negotiation during the early or formative period of the

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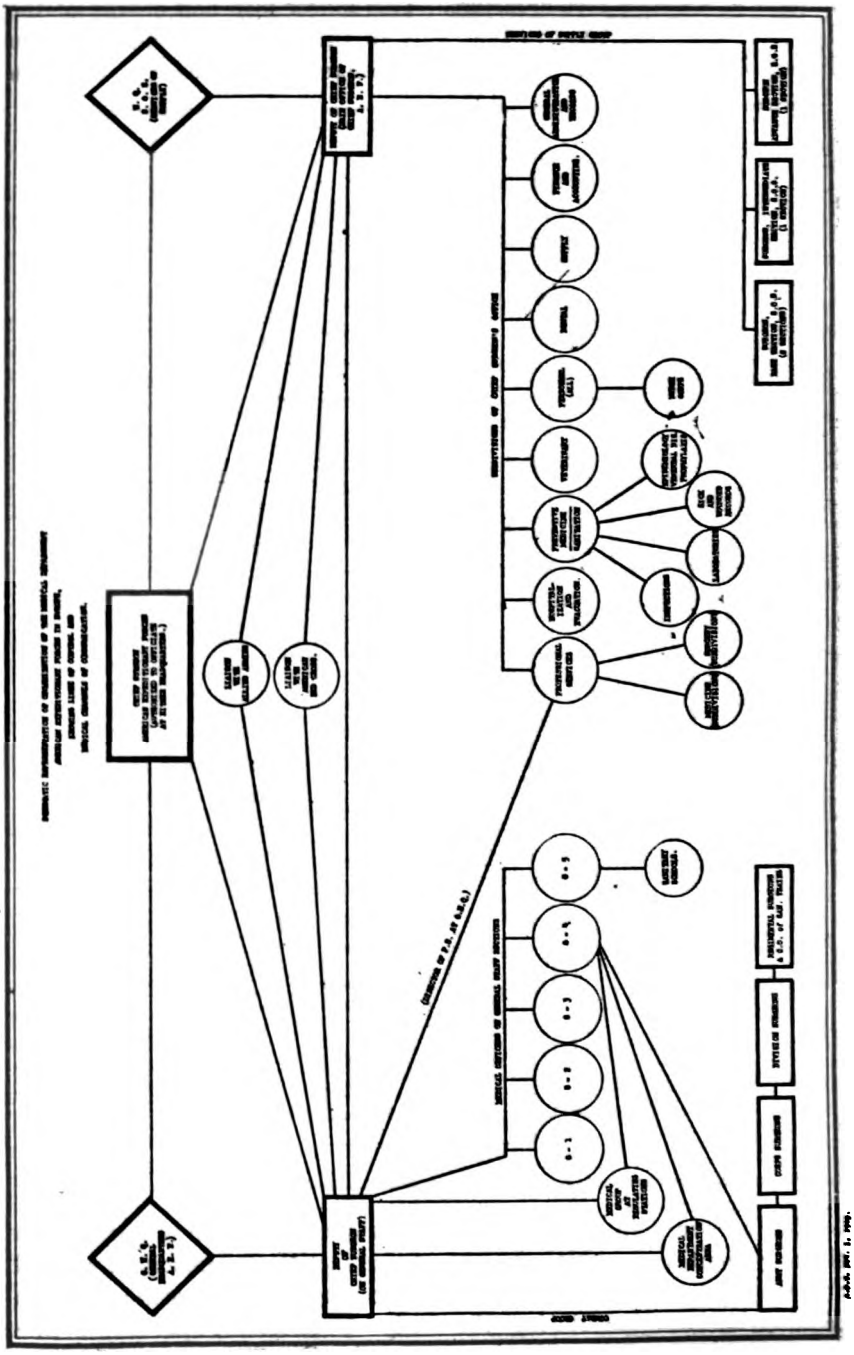

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American Expeditionary Forces had to do with the procurement of hospitals.

As has been mentioned, France is divided into military regions or departments. Each has its own headquarters, which exercises general control of all sanitary formations within its geographical limits except in those regions in the northern part of France. The occupation of this part of France had telescoped, so to speak, the northern tier of military regions, and a special delimiting line had been drawn. To further complicate the situation an arbitrary line had been drawn across the map of northern France which separated the Zone of the Armies from the Zone of the Interior or home territory. To the north of this line the commander of the forces in the field was absolutely supreme, except that, because of the telescoping referred to above, certain formations were exempted from the control of the commander of the armies and remained under the regional commander and the Ministry of War at Paris. This was particularly true of the hospitals, and from their location it was impossible to tell whether a given unit belonged to the Army or to the Interior. This gave rise to a peculiar situation. The French early adopted the plan of alternating the tour of duty of medical officers between the armies and the Zone of the Interior. For the reasons already explained, a French medical officer might find himself relieved from duty with troops, but assigned to a hospital which, while depending from the Ministry of War in Paris and technically in the Zone of the Interior, was actually at the front and daily exposed to aeroplane attack and long-distance shelling. This unusual condition is mentioned, as it illustrates what appeared at the time to be a most complex organization. It was necessary to be thoroughly familiar with the French organization in order to secure satisfactory results. Study and much patience were required to arrive at a working basis.

MEDICAL SUPPLIES

With the arrival of troops in June, July, and August, 1917, large quantities of medical supplies accumulated upon the docks at St. Nazaire. At that time every effort was being made to acquire permanent storage facilities for the Medical Department in the various sections of the A. E. F. As far as possible, supplies were put under temporary shelter until depots could be located and established. The first depot was established at Cosne and later became known as Intermediate Medical Supply Depot No. 3. For many months this served as our large accumulating and distributing point. Following this there were established depots at Is-sur-Tille (Advance Medical Supply Depot No.

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1) and another at Gievres (Intermediate Medical Supply Depot No. 2). In addition to the small medical supply unit provided for each division there were established eventually in the Zone of the Armies supply units as part of army parks. These parks usually carried about an eight-days reserve for the troops they were to serve.

It early became evident that the question of adequate medical supplies and equipment for the A. E. F. was to become a serious problem. Leaving the War Department at home to decide upon the quantity, character, and time for shipment would not meet our requirements. On the contrary, it was clearly evident that recourse on our part to routine requisitions would fall far short of remedying the situation. The entire subject of supply was given careful and laborious consideration. After numerous conferences the details of drawing up an "automatic supply list" were delegated to Col. A. P. Clark of the Medical Corps, who later became a member of the General Staff and acted as the Medical Department representative in all matters involving supplies and tonnage. The original supply studies made by him and the General Staff and officially promulgated in the late summer of 1917 contemplated placing supply procurement for the Medical Department of the A. E. F. as far as possible upon an automatic basis, and assumed the early establishment in France of a ninety-days reserve. The accumulation of this ninety-days reserve was deemed essential and had of necessity to be incorporated into any procurement plan. Of the contemplated total reserve fifteen, thirty and forty-five days' supplies were to be held in the advance, intermediate and base sections respectively. The automatic unit adopted was the amount of medical supplies necessary for 25,000 men for one month. The method devised for building up the reserve was by shipment to France for all troops embarked (and with troops when possible) of a four-months' supply, in addition to initial equipment. It was expected that troops en route to France would, before arrival at their final station in France, have consumed thirty days' supplies. This, therefore, would leave a balance of ninety days' supply which would accrue to the credit of the Medical Department in depot storage in France. Thereafter for each 25,000 troops in France there would be shipped to the A. E. F. each month one increment or unit of automatic supply in addition to the reserve shipments above mentioned.

Approximately 3,000 items appear on the automatic supply shipping list which was forwarded to the War Department and eventually adopted there. The prosecution of this scheme would have satisfactorily settled all supply difficulties. However, the upset in the shipping schedule created by the sudden necessity of sending an unexpectedly large

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number of combat troops to Europe in the spring of 1918 brought about a realization that we would never be able to accumulate a ninety-days' reserve in France. With a lack of bottoms to transport sufficient medical supplies to France, urgent needs rapidly ate into our small reserve and created in the supply depots a situation which we termed the "starvation period." At one time the situation bordered on the critical, and only through energetic efforts and extremely good judgment displayed by those charged with distribution was needless suffering averted.

To partially meet our needs European markets were combed with a view to obtaining in them any class of supplies, but particularly bulky articles that would result in a saving on transatlantic tonnage. In European purchase the chief difficulty centered on the slowness of delivery. When a General Purchasing Board was established for operation in Paris and London a medical officer was attached to it to represent the needs of the Medical Department. The term "tonnage" soon became a bugbear. One heard it on all sides. About every conceivable deficiency in the A. E. F. was or perhaps could be appropriately ascribed to lack of sufficient tonnage. In studying this problem early estimates by authorities in the United States had indicated that the Medical Department would require approximately 1 per cent of the total A. E. F. transatlantic tonnage. It was soon seen that, if shipments were conducted along any such basis, the building up of the much-needed reserve could never be accomplished. A figure more in keeping with requirements would have been an allotment to the Medical Department of 1.8 per cent of the total tonnage. For example, in February, 1918, despite conservancy efforts and comparative absence of combat activities, our reserve in depots in France fell below twenty days' supply. Fortunately, the stock was well balanced in essential articles. Urgent representation to our General Staff resulted in a big increase of medical tonnage allotments for the next two months. There was then put in force a system of tonnage allotments to the various supply services, apportioned monthly on a cabled statement from the United States of ship space available. Every effort was made by the General Staff to give the Medical Department a fair share of these allotments, but with another upset in the shipping schedule receipts of medical supplies again began to fall off at a dangerous rate. Realizing that we could never accumulate a ninety-days' reserve, forty-five days' supply was accepted as the figure at which we should aim, and every effort was concentrated on maintaining a balanced stock based on this figure. To make a long story short, we were never able to hit even this stride. However, in the final analysis our automatic supply list was so nicely balanced and our purchases abroad so well timed that, while we

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experienced many anxious moments, to be sure, over the outlook, at no time did suffering or want on the part of sick and wounded arise through lack of essential medical supplies.

PERSONNEL

Immediately upon the organization of the Headquarters, A. E. F., in Paris the Chief Surgeon was directed to prepare an estimate of the Medical Department personnel to be required. At that time there existed only the haziest idea as to the ultimate size of the American Army in France. In order that the estimate submitted could apply to whatever force might later be decided upon, it was necessary to accomplish it on a percentage basis.

A study of the Medical Departments of the allied armies revealed at once the fact that our Medical Department detachments authorized for combat troops were hopelessly inadequate, numerically. In an effort to correct this condition in our forces it was necessary, therefore, to begin this study by a thorough revision of our existing tables of organization. It was equally important to materially modify the organization of the divisional sanitary train and in addition to determine the number of evacuation hospitals, base hospitals, sanitary squads, camp hospitals, laboratories, administrative personnel, etc., required. The preparation of this estimate represented a tremendous amount of work and study, as one had to foresee, so far as was humanly possible, every contingency to arise in the future which would require Medical Department personnel. At this time the outlook regarding shipping and the transport of troops to France was most discouraging. It was only natural that every effort should be made to reduce the transportation of non-combatants to the absolute minimum. It was, therefore, with much trepidation that the grand total of requirements, including medical officers, dental surgeons, veterinarians, sanitary corps, nurses and enlisted men, was computed and then converted into a percentage. This was found to be 14.5 per cent. Considering the distance from home, the limited transportation, and the fact that the Medical Department, A. E. F., must be self-supporting, this figure, while large in the aggregate, seemed reasonable. It is still our opinion that any well-balanced army engaging in modern warfare should contain 11.5 per cent total medical personnel. A 14.5 per cent ratio in France would have necessitated a proportionate reduction below the 11.5 mean in the United States—9 to 10 there would have been sufficient.

Our estimate calling for 14.5 per cent was submitted to the Administrative Section of the General Staff for approval. Then followed another period of further study and ruthless pruning in the effort to limit

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Medical Department personnel to the lowest necessary figure. The figure finally agreed upon by the General Staff represented a ratio of 7.65 per cent for the total Medical Department personnel. In other words, for every 10,000 troops in France there should be 765 Medical Department personnel. At the final conference, when this decision was made, the Medical Department representative present stated that the Chief Surgeon was firmly convinced that his original estimate was approximately correct and more nearly in keeping with requirements than the figure adopted, but to permit a working basis to be arrived at with the least possible delay he was prepared to accept the General Staff estimate, believing that the General Staff would be as prompt in revising their figures, if events showed insufficient medical personnel had been provided, as the Chief Surgeon would be in requesting a reduction if the personnel allowed proved to be in excess of the needs. As time went on this question of the proper ratio of Medical Department personnel to the total strength of an expeditionary force ceased to be debatable. The Medical Department from the beginning to the end of hostilities labored under a handicap of personnel shortage so acute as to be difficult of comprehension by any except those who were on the ground. Officers, nurses, and men performed prodigies, but it was an effort which could not have been sustained over any very extended period. Fortunately the armistice arrived before the breaking point in physical endurance had been reached. Just how close it had approached is of course mere conjecture, but it is our opinion that the time when the Medical Department burden could no longer have been carried without material reinforcements from the United States could have been counted in days and perhaps in hours.

During the early summer of 1918 the total Medical Department personnel in France was just under 5 per cent, and while the final figures have not yet been accurately checked we are confident that the figure of 7.65 per cent authorized by the General Staff was not attained until some time after the armistice. Why this condition existed and why no adequate response to cabled appeals to the United States was made is not clear and will be reserved for discussion by us at a later date. Suffice it to say that the medical profession of the United States rose to a great emergency and added a very bright page to its history of past achievements.

HOSPITAL TRAINS AND REGULATING STATIONS

The Chief Surgeon had foreseen the necessity of making provision for hospital trains. A survey of the situation was made as early as

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July, 1917. It was found that the French army had only two complete hospital trains. Both of these were gifts, one having been presented by the American Ambulance at Paris and the other by a famous French opera singer. All of the balance (the French had a very large number) had been extemporized by installing litter racks in ordinary first, second and third class coaches. In some the litters were merely suspended from the ceiling by chains. The disadvantages of these trains were many. Lack of vestibuled arrangements rendered communication between cars impossible while the train was in motion. With the majority of trains no kitchen cars were provided, with the result that frequent stops were necessary both for feeding patients and to permit the medical officer to inspect serious cases. Because of these stops, trips to base hospitals in the rear were long drawn out and a source of much discomfort to patients. A large number of feeding points had to be maintained along the evacuating routes, and the personnel allowed the Medical Department, A. E. F., was so limited that such a method of evacuation could not be considered. With the French, while this arrangement in no wise measured up to their wishes, the objections were not so serious, for the reason that volunteer personnel could be depended upon to run the necessary kitchens and infirmaries at railroad stations. Moreover, as there were French military hospitals in practically every town in France, serious cases could be taken off almost anywhere if it became necessary.

All the different phases of the matter were studied, and the Chief Surgeon came to the conclusion that the A. E. F. hospital trains must be complete and self-sustaining—veritable hospitals on wheels. Later on the wisdom of this decision became very apparent.

An effort was made to purchase a number of trains from the French. It was found that the total available cars of the type necessary—corridor cars with side doors for loading—would be sufficient only for two trains. These were ordered for the earliest possible delivery. The British market was then investigated, and after considerable difficulty and much negotiation a contract was let for twenty complete trains. As the size of the A. E. F. increased and it became evident that the total expeditionary force was to be very much greater than had been originally intended or believed possible, additional contracts were placed with the British from time to time. Of a total of sixty trains ordered twenty-two had been delivered and were in operation on the date of the armistice. The value of these trains in effecting rapid evacuation from the front and the prevention of suffering cannot be overestimated. Many a wounded "doughboy" will carry a lifelong remembrance of these splendid trains, which shuttled back and forth,

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day and night, from the most advanced evacuation hospitals to the extreme southern points of France.

As these trains cost a very great deal of money, perhaps it will be charged that the Medical Department was extravagant in providing for so many. It may be noted here that during the Meuse-Argonne battle not only were all the American trains constantly employed, but in addition forty-seven trains borrowed from the French were in operation on our front and so buily engaged that the French army railway service complained bitterly because they could not have access to them long enough to grease the axles.

With the employment of hospital trains, the Medical Department first came into intimate contact with a military agency hitherto unknown in the American Army. We refer to the Regulating Station, that conception original with the French, of the proper mechanism for the supply of an army. A regulating station is a railroad station in the immediate rear of an army through which are forwarded all the reinforcements and supplies of every nature required by that army. The retrograde movement in the salvage of men, animals and material also flows through this station. It is presided over by a regulating officer whose immediate superior is the Assistant Chief of Staff, G-4, at General Headquarters. If we conceive of our storehouse at base ports and in the intermediate and advanced sections as reservoirs connected up with the regulating station of each army at the front, then the regulating officer might be likened to the man who controls the valves and allows just so much as is needed to meet the requirements of his army to flow out into the zone of that army.

On the staff of the regulating officer is a medical officer who is charged with various duties, but in times of active campaign he must see that all calls from evacuation hospitals for hospital trains are immediately filled. It will be evident that anything which interrupts the steady flow of wounded from the evacuation hospitals to the rear will prove disastrous. Let us assume that an evacuation hospital has a total bed capacity of 1,000 and that during each twenty-four hours of a battle that hospital must receive 2,000 patients. If we visualize northern France in the month of October, 1918, with constant rain and mud, a temperature that is just above freezing, with not a building of any kind left that will accommodate an overflow, then we can get an idea of the burden which rests on the shoulders of the regulating officer, and particularly the medical officer of his ataff who is charged with this movement of hospital trains. To complete the picture it is necessary to recall that, at the time when the demands on the hospital trains are heaviest, the movement of food, ammunition, forage, engineer

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supplies, etc., is also heaviest, and that all this material must necessarily have the right of way over hospital trains. The battle cannot be arrested to untangle railroad congestion, and to lose the battle in order to obey the dictates of humanity and save the wounded additional suffering gains nothing in the end. It will only mean fighting it over again with the additional toll of wounded and killed. The organization of an efficient evacuation service was one of the greatest problems which the Medical Department, A. E. F., had to solve. That the solution resulted in the development of an evacuation service capable of standing the strain of a great battle—long drawn out, with many thousands of casualties—will be shown by the writers in a subsequent article.

HOSPITALIZATION

A necessity for hospitals arose as soon as the first troops arrived in France. Our initial effort to secure what were absolutely needed has been previously detailed. No great difficulty was experienced in procuring from the French the small number required at that time. A hospital more or less meant little to them, as all France was literally dotted with military hospitals. When, however, our immediate needs had been met, the French were insistent that a hospitalization program be prepared, outlining what was considered necessary to meet our immediate as well as ultimate requirements. The French authorities in no wise attempted to influence the laying out of our program. While always ready to assist, they particularly refrained from offering unsolicited advice. Their chief concern was to ascertain what was wanted, expressed in terms of total beds, with the geographical distribution of those beds, in order that they might take stock of their own resources and harmonize their own plan with ours. This ushered in one of our greatest problems and brings us up to the preparation of the first hospitalization program for the A. E. F. Prior to its preparation one of the writers, accompanied by Colonel Castelli of the French army, had made an extended trip of inspection of French hospitals which might be available and suitably located for transfer to the A. E. F. Almost immediately upon the arrival of the Commander-in-Chief in France he directed the Chief Surgeon (Colonel Bradley) to make a similar trip. The same itinerary covering a trip of over 2,000 miles was repeated, and, based on the information so obtained, the preliminary hospitalization program was prepared. This program was of necessity tentative, for the reason that before it could become crystallized certain factors must be definitely decided, notably: (*a*) The approximate number of men on which the estimate was to be based; (*b*)

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the main railroad lines making up the lines of communication; and (*c*) the sector of the front which was to be the scene of the American effort.

Obviously it was impossible to construct hospitals in time to meet the immediate needs. Accordingly the French prepared to relinquish to us such hospitals as would be needed until an A. E. F. construction program could be instituted. After careful consideration the Chief Surgeon, on August 2, 1917, recommended that immediate steps be taken to provide 125,000 beds to meet the needs of 500,000 men eventually to be in France; also that barrack hospital construction of our own be inaugurated. On August 13, the Commander-in-Chief, after thorough study by the General Staff, A. E. F., authorized the establishment of 73,000 beds on the proposed lines of communication, based on the future needs of 300,000 men. We had gradually been acquiring existing hospitals from the French, but when the 73,000-bed program was authorized a progressive system of hospital procurement was adopted. Any attempts to administer our base hospitals under canvas would have proved impracticable. The first requisite was to find housing accommodations (shelter) for these units. This could be acquired in one of two ways—either take over existing buildings or quickly construct hospitals of our own of the hut or barrack type. France had been at war for over three years. Aside from her own needs she had within her boundaries a large British army and representative elements of the Italian, Portuguese and Belgian forces. Red Cross and other volunteer aid societies from all over the world were also extensively represented. When it is remembered that they had had first selection of existing hospitals or buildings suitable for use as hospitals, it can readily be imagined that when the United States entered upon its program of acquiring hospitals, very little in the way of choice was left. In fact, the majority of prospects discovered or offered were "left-overs" lacking essential and rudimentary hospital features. Either they were located in out-of-the-way places or were unsuitable from the standpoint of size, conveniences, or general architectural arrangement.

In these statements no criticism is intended. It was largely due to the hearty coöperation of the French that the American Medical Department was able to meet its responsibilities. No reasonable request was ever refused. The two services worked in complete harmony. The war offered no finer example of the subordination of personal or even national aims and ambitions than was produced by these two national medical services working together in a common cause in their humanitarian effort to mitigate the sufferings of the wounded and to preserve the health of the well. Among the hospitals turned over to us by the French were some of the very best in France. On the other hand, many of the hos-

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pitals or buildings taken over from them required alterations, additions and repairs. In fact, practically all of them were greatly increased in capacity soon after they came under our control. This was accomplished either by erecting ward hut buildings in the yard or on adjoining land, or taking over suitable buildings in the neighborhood. Before the lapse of many weeks it was realized that a limit of relinquishment to us would be reached beyond which the French could not safely go without seriously impairing the adequacy of their own hospital service. While pushing ahead with the acquisition of hotels, schools, barracks, etc., even in the more remote regions of France and as far down as the Riviera, where railroad traffic was subject to frequent interruption, it became evident that an energetic hospital construction program was imperative. An inspection of plans for base hospitals sent over by the War Department disclosed that their use would prove impracticable in France because of the scarcity of building material.

Therefore one of the first duties devolving upon the Chief Surgeon in providing for hospitalization was to design and draw up complete and detailed plans for our barrack hospitals. This duty fell to Colonel Tuttle to perform. Two types of units were adopted for construction, both of a standard and simple design. The larger or type "A" unit accommodated a base hospital and provided a normal capacity in buildings of 1,000 beds, which in emergencies—or crises, as they were frequently termed—could be increased to 2,000 beds by erecting tents in prolongation of the ward huts. The smaller or type "B" unit was a 300-bed camp hospital designed for isolated commands and the use of the divisions in the training areas. In emergencies and without increase in overhead personnel, its capacity could also be doubled. These standard units, as designed, were complete in every particular. The basic principle in their construction was the use of a 20 by 100 feet double walled knock-down hut such as could be obtained in Europe. The wooden and sheet-steel types were mill-fabricated. Where local resources would permit, concrete blocks, bricks or stone were freely used. The component parts of the standardized hut were so divided as to permit of considerable latitude in the dimensions of some of the buildings in the hospital group. For example, the ward building in the base hospital unit was 20 by 160 feet and accommodated fifty beds, in addition to its administrative, culinary and toilet requirements. Detailed description of base and camp hospital lay-outs will be reserved for a later article.

In an effort to economize in building material, careful pruning had resulted in the elimination of what might have been considered non-essential features. Plans for these two types of hospitals were submitted to the A. E. F. General Staff and approved as prepared. One

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feature of the approved plan omitted in the construction was the provision for covered (overhead) passageways connecting all wards, clinical and mess buildings. In so rainy a part of France as we were required to occupy this protection seemed absolutely necessary. Scarcity of lumber was the reason assigned by the Construction Department for the deviation from the plan. In certain places these standardized base hospital units were grouped to form "Hospital Centers." These centers contained anywhere from two to twenty base hospitals. In the course of the first year these American hospital municipalities sprang up in various parts of France. As regards location, the decision was soon reached to establish our hospitalization along the lines of communication concentrating into centers wherever feasible and adhering as far as possible to a distribution of hospital facilities which would approximately provide for 15 per cent of our total beds in the advance section, 60 per cent in the intermediate section, and 25 per cent in the base section. Following our initial effort at Bazoilles, sites were speedily selected and construction ordered at Rimaucourt, Bordeaux, Beaune, Allerey, Mars, Mesves, Limoges, Perigueux, Nantes, etc., on a progressive scale.

In October, 1917 the Administrative Section of the General Staff, A. E. F., materially changed our automatic hospitalization allowances by placing them on a phase basis. For normal hospitalization there was allowed 10 per cent of beds, computed on our total strength in Europe, and to provide for combat conditions an additional 10 per cent on the strictly combatant troops. As we were still forging ahead in our attempts to provide the original 73,000 beds authorized, we at no time came in conflict with this provision, and in the summer of 1918 it was rescinded in favor of a flat percentage of 15 per cent on all troops.

In February, 1918, when the organization scheme under which the war was fought (by American troops) was adopted, there were in France six divisions which, with their "overhead," gave an A. E. F. strength of about 250,000 men. The number of normal beds available at that time was approximately 11,000 and the number of patients in hospital 5,000. Orders for the acquisition or construction of hospitals had already passed the 73,000 mark. Construction work was being speeded up.

One of the early studies made on hospitalization resulted in recognizing the expediency of organizing base and evacuation hospitals on a capacity of 1,000 beds each. As a result of cabled representations to the United States, this change was adopted. At this time it was believed that the divisional field hospitals would meet the purpose for which they had been designed, provided there were added to them special material for the treatment of gas cases and portable sterilizing, X-ray, and electric

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lighting features to provide surgical facilities for the non-transportable wounded. Under the A. E. F. organization this group of surgical material became known as the "Mobile Surgical Unit." It was mounted on two motor trucks or on a truck and trailer.

Based on their experience in the war the French had adopted a type of mobile sanitary formation which was known as an "Autochir." As railhead facilities for our evacuation hospitals promised to be quite limited, it was early recognized that there would be a need in the American service for a formation of the French type, to bridge the gap between field and evacuation hospitals and bring expert surgical assistance nearer the seriously wounded men. Twenty of these units were ordered, and as organized and equipped were known as "mobile hospitals." They were placed at the disposal of the army surgeon, who turned them over either to the corps surgeon for emergency use during combat operations or he himself designated a location for them close to the front.

As for our evacuation hospitals, the majority of them functioned under the tentage with which they are normally provided. During the three-year period of static or trench warfare the French had constructed just behind their lines some excellent evacuation hospital establishments. Whenever American troops took over a sector from the French these formations were turned over to and occupied by us. Under these conditions the evacuation hospital personnel operating them utilized their canvas only in meeting occasional expansion requirements. Facing the remote possibility of a prolonged participation in trench warfare, we had drawn up suitable plans for evacuation hospitals of the "hut" type. With the onset of open warfare, initiated by the Germans in the spring of 1918, all ideas of constructing these hospitals were abandoned. Of course, even during the mobile operations, advantage was always taken by an evacuation hospital to occupy any buildings whenever they became available.

What was the condition of our fixed hospitalization at the time of the armistice (November 11, 1918)?

At that date there were in operation 153 base hospitals, 66 camp hospitals and 12 convalescent camps.

The greatest number of A. E. F. patients in base and camp hospitals and convalescent camps in France and England was in the week ending November 7, 1918, when a total of 190,988 beds were occupied by sick and wounded. Of these beds 39,778 were classed as emergency beds.

On the day the armistice was signed there were occupied or available a total of 209,134 normal beds. In addition, there was available space and equipment for emergency beds for 74,399 more patients, or a total of 283,633 normal and emergency beds.

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Between November 11 and December 5, the number of normal beds was increased to 223,257, with an emergency expansion up to 296,835.

In hospitals actually operating at the time of the armistice or in buildings that had been leased for hospital purposes or were being constructed by us on the type "A" plan, there would have been provided a normal bed capacity of 423,722 with an emergency expansion up to 541,000 beds!

Of our own construction we had in operation 14 hospital centers, containing from 2 to 12 or more type "A" base hospitals. On November 11, when the greatest tax was being made on the capacity of our hospitals, of the 153 base hospitals above mentioned 75 of them were functioning in type "A" hospital units of our own construction. These were complete in every respect. The construction of 20 more units was well along, and such buildings belonging to them as had been completed were used by adjoining units while the rush was on.

In the hospital centers that had been organized by taking over French buildings and adding to their capacity by construction of our own, we were operating about 56,000 beds.

When one stops to consider that our type "A" A. E. F. base hospital unit had a normal capacity of 1,000 beds, which could be increased to 2,000 beds in emergencies, the reason for our hospital elasticity as measured by emergency capacity is clearly understood. At the time that the apex (over 209,000) of "beds occupied" was reached an analysis shows that over 70 per cent of the total beds provided to meet that emergency were in the type "A" hospital centers of our own construction.

THE AMERICAN RED CROSS

While mention of the American Red Cross does not fittingly fall under our caption, this review would not be complete without a passing reference to the most valuable assistance rendered by this organization in meeting many of our problems. From the very beginning the Red Cross Society coöperated with the Medical Department in a manner deserving of the highest praise. After a board of medical officers had standardized splints and dressings for use at the front, the Red Cross took charge of their manufacture on a very large scale and with the highest degree of success. It also equipped and operated in France a factory for the manufacture of nitrous oxide and other gases. This step was taken to save tonnage, as the containers for these gases were quite bulky. The Red Cross supplied automobiles to medical officers who were helpless without transportation and could get it in no other way. Funds for research work that otherwise could not have been performed were always forth-

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coming. It would be well-nigh impossible to enumerate all the activities carried on by this great organization, but the one for which thousands of wounded officers and men have cause to be thankful was the establishment under Red Cross auspices of numerous hospitals throughout France. When the exigencies of the military situation made it necessary to hurry American troops into line far from the American sector and American hospitals it was the Red Cross which virtually bridged the gap and made it possible, through the establishment of its splendid hospitals in Paris, to give the wounded of the Chateau-Thierry fighting proper care. A volume could and should be written covering the valuable work done by this organization. Here it can only be indicated. In a later article it is hoped that the development of the military relief work of the Red Cross in Europe can be given more in detail.

CONCLUSION

In a very sketchy and superficial way this article may convey some idea of the magnitude of the problems that confronted the Medical Department in France. No reference has been made to the professional service and the splendid work done by that body. A discussion of this interesting subject does not belong under this title except as the Professional Services played a vitally important part in the solution of the many difficult technical questions arising. Neither have there been discussed the many difficulties attendant upon a complete change of organization in our system of control and supervision over the auxiliary services, the problem of creating and equipping new units in France, the necessity of creating an efficient medical corps with only about two hundred trained officers among a total of eighteen thousand, or the problems of promotion, etc., etc., too numerous to mention.

Was it not to be expected that with no adequate peace-time preparation for war—in fact, little public interest in preparedness—the machine should have creaked at times? While there have been some inefficiency, and complaints of individual injustices is it not strange that we did not hear more? And, lastly, is it not sufficient recompense that one should have been permitted to play a part—if only a small one—in the Great Adventure?

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THE IMPORTANCE OF PHYSICAL THERAPY IN MILITARY AND CIVIL PRACTICE[1]

By Commander WILLIAM SEAMAN BAINBRIDGE
Medical Corps, U. S. N. R. F.

THE war has taught many valuable lessons both from the medical and surgical standpoints, among them that physical therapy is useful in the training of men and in the treatment and functional reëducation of the disabled soldier.

But while the war has impressed upon us the fact that disabled men can be, in the large majority of cases, successfully treated, retrained and reëducated—in short, that a human salvage system has been evolved and perfected—the lesson thus learned by bitter experience will have been more or less in vain unless its principles are applied to civil life. Industry takes as great a toll of man-power yearly as war on a colossal scale, and the results of industrial accidents are nowhere so evident as in the United States.

It has been computed on reliable authority that 14,000 industrial accidents, which result in permanent disablement, occur every year in this country, and that the average age of those persons thus injured is between thirty and thirty-five. From the five years ending December, 1917, a total of 16,526 workmen were killed and 49,000 injured in our mines and quarries.

For the same period the railroads of the United States killed 48,801 and injured 931,764.

According to an article by Dr. Shirley W. Wynne in the *New York Medical Journal*, December 22, 1917, there occurred in New York City, in 1916, 661 deaths from street accidents, a rate of 7.26 per 100,000 population; and more than 10,000 accidents occurred which did not end fatally. It is stated in the New York State Department of Labor, Bulletin 80, 1917, that approximately four times more people were employed in the factories of the states than were employed in building and construction work, and yet during the four years from October 1, 1910, to September 30, 1914, more fatalities and more serious accidents occurred in building and construction work than in the factories. In New York State during the year ending September 30, 1914, there were reported a total of 88,314 non-fatal accidents. It has been estimated that at least three-quarters of a million casualties occur among

[1] Some ideas, suggested by the war and its results, as to the promotion of naval and military efficiency and how the principles thus learned and emphasized can be best applied to civil life.

Read at annual meeting, St. Louis, Mo., October 13-15, 1919.

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wage-earners each year in this country, and that there are not less than 500,000 persons of working age who are suffering from permanent vocational handicap.

Dr. Alexander Lambert, in his presidential address to the members of the American Medical Association on June 10, 1919, pointed out that this war had taught us that there remained economic value in the maimed and wounded, and that it was our duty to develop this value to its fullest extent. The maiming and injury of American workers in the every-day work of industry far exceeded the battle casualties of war, and there was an economic necessity and duty to be performed in the salvage and reconstruction of the industrially injured.

However, there is no need to further elaborate the point that physical therapy, which was brought to its present state of perfection as a war emergency measure, is essential to the economic and healthful interest of the country as a settled policy. The scope of physical therapy is not restricted to the treatment of those injured in industrial work or by accidents of every description, but is applicable to the treatment of many other pathological conditions and of various physical defects resulting from disease.

The writer, having been engaged in hospital work for many years in America and for more than two years in various parts of Europe, and having himself taken a course in physical education, has been forcibly impressed with the importance of the physical therapeutic side of the work of many of the hospitals in Germany, Sweden, France and elsewhere. As the outcome of experience and observation in the many hospitals visited by him in the different warring countries, before and since the outbreak of hostilities, and from a study of the medical literature, it appears to him that in our own country, civil and official authorities, from now on and always, should aim at preparedness for the successful prosecution of warfare, both industrial and military. He therefore puts forward the following three suggestions:

First Suggestion.—That civilian hospitals in time of peace shall have departments fully equipped for the employment of physical therapy, so that they can be utilized not only for the treatment of the injured but also, as far as may be possible, secure a maximum of physical efficiency among the general population.

This war has demonstrated most conclusively that no patient recovering from a serious wound, surgical or otherwise, should be discharged until every effort has been made to send him out in as sound a condition as circumstances permit, and with reasonable assurance that no remediable disabling after-effects persist.

Heretofore it has been the almost invariable custom to discharge

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the patient with as little delay as possible. It appears reasonable to argue that many a stiff joint or other disabling after-effects of operation, or injury, might have been completely remedied or considerably avoided by retaining the patient for a longer time on the in- or out-patient's list. Physical agents, such as thermal, mechanical electrical treatment, curative workshop treatment, and so on, might have been intelligently utilized.

Moreover, prolonged immobilization of a joint injury or fractured limb is by no means in all instances the best treatment from the standpoint of the future usefulness of the said limb.

As was pointed out in the special number of the *United States Naval Medical Bulletin*, recently published—A Report on Medical and Surgical Developments of the War—issued by the Bureau of Medicine and Surgery, Navy Department, C. Willems, in charge of the Belgian Military Hospital at Hoogstade and of the one at Bourbourg, had been struck before the war with the fallacy of prolonged immobilization of joint lesions. During the war he has had the opportunity of studying a large number of cases and perfecting the method of treatment which is based upon the principle of immediate active mobilization of the joint. The results from this new method of treatment have been, according to the Belgian surgeon, brilliantly successful and have amply confirmed his pre-war views.

J. W. Dowden, Surgeon to the Royal Infirmary, Edinburgh, who had four years' war experience of treating fractures and injuries to joints, writing in the *International Journal of Surgery*, April, 1919, stated that in his opinion the most important surgical lesson of the war was the appalling results from fixation by splints. Dowden declared that the art of surgery was to do without splints and said that for the past twelve years he had practically given up splints in the treatment of fractures of the upper extremity. Passive movement and active movement, short of pain, frequently practiced during the day, always increasing in extent, was the treatment followed by Dowden during the war with remarkable success. According to the same authority, massage of fractures and joint injuries is soothing, helpful and encouraging in its results, provided it is carried out short of pain.

Another lesson which has been gleaned from the surgical experiences of the war is that the necessity for amputations is considerably lessened.

These lessons should not be overlooked in hospitals in peace time. Therefore, over and above the usual medical and surgical equipment, every large hospital, and especially those in which surgical cases are treated, should be supplied with the necessary apparatus for using all the essential forms of physical therapy, with perhaps such curative

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workshop treatment, or some substitute, as seems best adapted to speedily and efficiently restore the individual to a condition of physical fitness, which will insure that he is an economic asset in peace and of value to the country in time of war.

It is obvious that every large civil hospital thus equipped is a potential base hospital, convalescent camp, or institution for the reëducation of disabled soldiers, while at the same time it is actively engaged in doing its part toward maintaining the highest standard of physical efficiency so far as the civilian population is concerned. The latter is a most important point.

The war showed that in every civilized country there was an undue proportion of its adult population who were unfit or who suffered from some physical defect. Perhaps the majority of these physical defects could be remedied by judicious treatment and scientific training.

In the course of a discussion of a paper read in this country, shortly after his return from abroad, Dr. R. Tait McKenzie, Professor of Physical Education in the University of Pennsylvania, and late Major, R. A. M. C., said that in his inspection of training camps in Great Britain it was his duty to travel from one to the other. A considerable number of men were repeatedly found who were unable to take full training. These were paraded, and by examination it was discovered that many were suffering from conditions which could be cured by proper treatment, sometimes by operation, but more frequently by some form of physical therapy, which would bring them back to military usefulness.

The general population of the countries at war in Europe have undergone practically a course of physical training, and, to a somewhat less extent, this country has undergone a similar course. It has been to the benefit of practically all concerned and supplies a strong reason why such methods should be widely introduced.

Second Suggestion.—That civilian hospitals shall be so equipped in time of peace as to be more quickly available by the Government in an efficient condition for military service in the event of war.

The experience in the great war has been that it is most difficult to increase the scope of civil hospitals for military purposes without considerable disorganization of the institutions. The civilian hospitals in this country do not have very many beds to spare. Even during the war, with three or four million men away and with practically no immigration for three years—totaling about 3,000,000 people—there were very few extra beds that could be employed for military purposes without crowding the needs of the general population. An attempt to utilize the civil hospitals resulted in a great deal of confusion, in difficulty in the treatment of cases, and in a mixing of records.

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If the suggestions contained in this paper are to be carried out in part or in full, there must be more hospital beds (relative to population) in time of peace—ready for war-time emergency—than in the past. Otherwise the Army and Navy will have to be sufficient unto themselves and be ready at all times for large crisis expansion.

Many of those who have been through this war, and whose judgments are relied upon, feel that such necessary expansibility of civilian hospitals in time of war is impossible of accomplishment, and that the Army and Navy themselves must be ready to assume the burden. On the other hand, there are those of expert knowledge who affirm that such a plan can be carried out most successfully. However, the writer believes that a happy medium is possible and desirable.

Col. Charles Richard has pointed out that the civil hospital is no longer an establishment merely for the care of the sick and injured, but has become in addition a teaching institution with a staff of men eminent in their respective spheres, actuated by the spirit of progress, and whose work and coördinated experiences are directed toward the betterment and happiness of the race.

In former years military posts were isolated in such a manner that it was impossible for the medical officer to come into contact with his colleagues in civil life or to keep in touch with civilian hospitals. Nowadays the situation is changed; the medical officer has been enabled to come into closer relationship with his civilian brother medical man and also with the civil hospitals. Colonel Richard expressed his regret that this relationship could not be strengthened further by assigning medical officers to duty at civil hospitals for limited periods, as was done in some of the foreign services.

Germany had, perhaps, more nearly solved the problem of prompt and efficient coöperation between military and civilian hospitals than had any other country. Armit has drawn attention to this, and has described how the German hospital system, more nearly than that of any country, was such as to render feasible the quick and efficient transition of hospitals from civil to military status. The custom of appointing army and navy surgeons to large hospitals—the Charité at Berlin, for instance—in order that they might have post graduate practice in time of peace, brought about the intimate civil and military relationship which Colonel Richard desired to see in vogue in this country.

Maj. John R. McDill, M. C. R., U. S. A., also gives an account, in his medical war annual, No. 5, entitled "Lessons from the Enemy," of how, in time of war, all the hospitals of Germany were promptly placed upon an efficient military basis. German physicians were quick

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to recognize the value of physical therapeutics, with, or adjuvant to, regular medical and surgical practice. The excellent equipment of German hospitals with the necessary facilities for the utilization of physio-therapeutic measures proved another and most important factor in the rapid transition of the status of these institutions and similarly in the equipment and utilization of war-time hospitals.

In proportion, as it would be advantageous for army and navy medical officers to be afforded the opportunity to gain experience in large general hospitals in times of peace, so likewise it would be beneficial for officers of the Medical Reserve Force of the Army and Navy to be allowed facilities to gain practical experience with troops, or on ships and at base hospitals, before being called upon to make use of their training in actual warfare.

There seems to be no doubt that a relationship between civil and military medical men and institutions would be decidedly conducive to greater efficiency of the medical department when called into service by the exigencies of war.

It may be assumed that a departure of this kind would result in the stimulation of interest in military medicine among medical students and young practitioners, thus tending to raise the standard of efficiency of the general medical service upon which the nation must depend for the restoration to active military duty or to useful civil life of sick and wounded soldiers.

Third Suggestion.—That military hospitals, both temporary and permanent, shall be equipped in such a manner during peace, so that when utilized in time of war the maximum of medical and surgical efficiency may be attained.

The general equipment of the military hospital for routine medical and surgical work, in war and peace, must be taken for granted. With respect to equipment along physio-therapeutic lines as indicated above, far too little has been definitely done.

The argument that hospitals should be equipped with all the means necessary to apply such treatment in order that they may be utilized in time of peace to secure the maximum medical and surgical efficiency in time of war, is valid and rational.

If, as suggested in this paper, every good sized hospital, or at any rate, every large hospital which takes in a considerable number of surgical cases, shall have departments of physical therapy, it follows that there must be sufficient skilled exponents of this form of treatment.

Capt. E. A. Bott, of the Military School, Hart House, Toronto, read a paper before the International Conference on the Rehabilitation of the Disabled, held in New York, March 18 to 21, 1919, in which he em-

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phasized the point that the lessons learned as to functional restoration during the war would be useful when applied to civil conditions of living. He advocated the training of lay workers in physical therapy, in passive and active movements and in various forms of applied exercises. He drew attention to the obvious fact that if physical therapy was to be conducted with success, trained lay workers must be mainly relied upon. It is conceivable then that military hospitals equipped with facilities for making use of physio-therapy, might be utilized as training schools for men to be called upon later to administer the various physical adjuvant measures which have been found so essential in the present war.

A military hospital thus equipped in order to best serve as a physical therapeutic training school might do well to offer the facilities of its physio-therapeutic department to civil hospitals for the treatment of suitable cases. If this were done the treatment could be taken over by the military hospital at the very stage where the civil hospital so frequently leaves off, to the lasting detriment, all too often, of the patient and of the entire community.

This kind of military hospital, equipped and utilized in the manner just described, working in conjunction and coöperation with civilian hospitals in the vicinity, would act as a wholesome example to other civilian hospitals and would serve the valuable purpose of encouraging such institutions in other parts of the country to similarly equip themselves.

This, too, would have the effect of constantly directing attention not only to the conservation of life, but also of limb.

The results of this proposed equipment of and treatment in military hospitals, temporary and permanent, during war, should be:

(*a*) The retention in active service of the effective and the elimination of the non-effective.

(*b*) The prevention, so far as can be accomplished, of disabling after-effects of wounds.

(*c*) The restoration of useful soldiers to the army and sailors to the navy in the shortest time possible.

(*d*) A minimum of civilian inutility by the limitation of disability, by means of treatment and reëducation of men who cannot be cured completely, thus preserving as far as possible, their capacity for work in the future.

(*e*) An economy to the States not only through the reduction of pensions, but also, because men, through treatment, will be rendered self supporting and a help rather than a burden to the community.

It seems obvious that regardless of any features during peace, pertaining to either civil or military hospital equipment, when war comes,

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certain requirements, in the light of the experience of the past three years, must be met by institutions which serve, temporarily or permanently as military hospitals.

The conflict just ended has so greatly widened the scope, and on certain points crystallized views as to the medical and surgical care of the sick and wounded combatants, that it will be superfluous here to dwell upon this particular phase of medico-military work.

Among the lessons learned was that much excellent work was nullified, from military and economic standpoints, through lack of proper care during the period of surgical convalescence. It is to this aspect of practice, and to the value of physical therapy in this connection, that it is desired to direct special attention, in the hope that our own Government will profit by the experience of the belligerents on both sides in the war.

Among the Allies, France took the lead in this work.

As Dr. Andre Treves pointed out in a paper read by him at the International Conference on Rehabilitation held in New York in March, 1919, a ministerial circular dated December 31, 1914, ordered simultaneously the organization of "centers" or hospitals of orthopedic surgery and centers of functional reëducation, which in France are termed centers of physio-therapy.

The French Government has made liberal appropriations to its department of physio-therapy and has installed all the necessary methods of treatment, massage, mechano-therapy, thermo-therapy, aero-therapy, radio-therapy, etc. Thanks to her wealth in mineral waters, France has been able to give her wounded the benefit of these valuable therapeutic agents. Mineral waters and mud baths have been used and have yielded remarkable results. In all these places are situated hospitals for physio-therapy and thermal cures.

In January, 1915, the Grand Palais in Paris was converted into a hospital for the physical treatment of the wounded. It is a vast military hospital, the central unit in France for the treatment of the wounded largely by physical means.

Dr. Camus, Chief of the Central Service for Physical Treatment, who has been largely responsible for the physical therapy movement in France, reported in March, 1916, that the improvements due to the various forms of this treatment, judged from the function measured on arrival and before discharge, showed an average mean gain of 30 per cent. The medical officers determine in each case admitted:

(*a*) The diagnosis.

(*b*) The degree of incapacity for work generally, and as regards the injured limb or limbs in particular.

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(*c*) The treatment to be instituted.

By this system it is possible to proceed with the management of each case with a fairly definite end in view—restoration to active military service, to auxiliary military service or to civil life.

During a tour of inspection made by the writer in 1915, he was deeply impressed by this phase of the work in France, Germany and Austria. Since that time the system of physical treatment has been elaborated and improved and the "combined treatment" inaugurated at the Grand Palais has been extended to Great Britain and to the other allied countries.

Of those who have worked in France for the rehabilitation of disabled soldiers, none has done more than Dr. Maurice Bourrillon. He was the initiator of the methods for restoring functional ability put into practice first at the Vacassy Institute at St. Maurice near Paris. In 1914 and 1915 ten schools of this type were established in France, and at the end of 1918 there were 124 of these schools stretching from Paris to Algeria.

Great Britain was somewhat behind hand in recognizing the importance of these matters. However, she has made great efforts to make up for lost time and now possesses a thorough system of physical therapy. Col. Sir Robert Jones is mainly responsible for the chain of military orthopedic hospitals which runs through Great Britain.

In the Military Orthopedic Hospital at Shepherd's Bush, a suburb of London, which may be taken as an example of the others, the various forms of treatment are grouped as follows:

(*a*) Operation.
(*b*) Electro-therapy.
(*c*) Massage.
(*d*) Hydro-therapy.
(*e*) Fixation methods.
(*f*) Exercise.
(*g*) Manipulation.
(*h*) Curative manual treatment in workshops.

In the hospitals of Great Britain in which physical therapeutic methods are in vogue, the curative manual treatment in workshops is perhaps more favored than other forms of physical therapy.

Col. Sir Robert Jones, writing in "Recalled to Life," November 1, 1918, pointed out the good features of the method. He showed that it was not only interesting and useful, but valuable from the psychological point of view and, when employed intelligently, of great curative service. The chief point to remember with regard to this method is that each piece of work performed is a prescription by the surgeon for

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a specific joint or muscle disability. Moreover, apart from its surgical interest and importance the method has the outstanding merit of simplicity and cheapness.

Maj. R. Tait McKenzie is of the opinion that while the curative workshop methods are productive of a great deal of benefit to disabled men, too great reliance should not be placed on these means because they do not always exercise injured limbs in the right places nor in the correct way. Others agree with these views. As a matter of fact, experience seems to have shown that both methods have their places in functional restoration. They are not antagonistic in any way, but should be coördinated.

In Italy, physical therapy has reached a high standard, and especially that branch of orthopedic surgery known as kineplastics.

Belgium followed close on the heels of France in developing physical therapy. L'Hôpital de L'Ocean in La Panne, Belgium, under the direction of the well known surgeon, Depage, is one of the most completely equipped orthopedic hospitals of the world. In addition to this institution a Belgian center was created in France by the French War Ministry at Port Villez, in 1914.

In Canada and Australia, hospitals for the care and treatment of the disabled soldiers, equipped and arranged in much the same manner as in Great Britain, have been established.

As said before, Germany, more quickly than any other of the warring nations, set in motion the machinery for treating and training her disabled soldiers after the period of wound healing had passed.

Dr. Frank Radcliffe puts the case succinctly when he says that the application of physical therapeutics to pathological conditions must depend, for its success, upon careful selection and accuracy of the dose employed and also upon persistence in following a course of treatment. The medical man is likely to underestimate the range and effectiveness of a most powerful and versatile system of therapeutics and one which may be always at his command. The physical therapist not only must be well trained and skillful but must be discreet and wise. The personal equation must be always considered, as physical therapy in its application resembles diet—"What is one man's meat is another man's poison."

If this rule were strictly followed there would be little fear of this form of treatment falling into unqualified hands, and the army of quacks and charlatans, who abound everywhere, would no longer be able to deceive the people with ignorant advice and unskilled treatment. This adds force to the argument that physical therapy should be scientifically taught and that departments of physical therapy should be added to every good-sized hospital throughout the country.

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Radcliffe thus enumerates some of the conditions which he believes can be successfully dealt with by physical methods, viz., by hydrology, electricity, massage, exercise, active and passive:

(*a*) Debility from any cause, *e. g.*, pneumonia, typhoid, dysentery, all post operative conditions, *e. g.*, appendicitis, hernia, etc.

(*b*) Rheumatism, including myositis, myalgia, fibrositis, rheumatoid arthritis, osteo-arthritis.

(*c*) Neuritis, including neuralgias of all kinds, particularly headaches, which are often of rheumatic origin, due to fibrositis of the cervical muscles.

(*d*) Nervous conditions including neurasthenia, loss of nerve tone, general tremors, and insomnia associated with the overstrain of war and so-called shell shock.

(*e*) Heart conditions, especially arrhythmia, tachycardia, bradycardia, loss of myocardial tone, dilatation, whether associated with valvular disease or not.

(*f*) Post-operative conditions such as adhesions, following abdominal operations, and contracted scars due to deformity.

(*g*) Fractures with only fibrous union, in other words, deficiency of callus.

(*h*) Paralysis and paresis of any nerve, more particularly facial, ulnar, median, musculo-spiral, sciatic and branches.

(*i*) Synovitis and fibrous ankylosis of large or small joints where breaking down of tissue and reëducation are necessary.

(*j*) Circulatory conditions, such as trench feet, post frost-bite and erythromalgia.

This is undoubtedly an overstatement, containing many truths, however, not yet recognized, but pointing the way.

SUMMARY

1. The war has emphasized the value of physical therapy and has proved that its employment is essential to the successful treatment of many physical disabilities, caused by injuries or occurring as the result of physical defects, or of disease.

2. It has also shown that physical methods are of the greatest importance in the securing and maintaining of general health. Physical training of the right sort will render a large number of the unfit able to endure prolonged exertion.

3. Many functional disorders and especially the neuroses, and some diseases are amenable to treatment by physical therapy. In short, physical therapy scientifically and intelligently applied may now be regarded as a fundamental branch of medical and surgical treatment.

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4. Moreover, it is obvious that such methods are as applicable to the conditions of civil life as to those of war time and particularly in an industrial country such as the United States in which accidents are very prevalent and neuroses are rife.

5. It would seem, then, to be conducive to the public health and welfare generally that these methods should be more generally introduced into civil hospitals and civil practice.

6. With this end in view the suggestion appears to be timely, that facilities should be afforded at medical schools and hospitals for medical men and medical students to become instructed in the science and practice of physical therapy.

7. Opportunities should be also provided for the thorough training of exponents of physical therapy.

8. Further, that some civilian hospitals, those of large size at any rate, should have departments fully equipped for the employment of physical therapy, so that not only may the injured when necessary, be thus treated, but also certain functional disorders and diseases, in order that as far as possible, a maximum of physical efficiency may be attained among the general population.

9. The civilian hospitals in time of peace may be equipped in such a manner and with regard to physical therapy in particular, that they may be easily available, in a good working condition, by the Government, for military service in the event of war.

10. That military and naval hospitals be maintained in such a high state of efficiency in time of peace that the best results may be obtained from them in time of war.

11. That in time of peace there should be coöperation or an intimate relationship between military and naval hospitals which cannot fail to be of mutual advantage to civil and military and naval surgeons and to the great benefit of the community at large.

The main suggestions in this paper are that civil, military and naval hospitals shall work in unison in time of peace, so that they may be prepared for war, and that as physical therapy has been of so great value in war, it should be thoroughly and scientifically taught, and that large civilian hospitals should be equipped in such a way that it may be practised therein for the relief and care of injuries, for the avoidance of crippling, and for the treatment of functional disorders and of those diseases in which it has shown itself beneficial.

DISCUSSION

LIEUT. COLONEL D. A. CLARK, C. A. M. C.: The masterly paper of Commander Bainbridge outlines a situation of great interest and much

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importance, not alone to military surgeons and public health officers, but also to all practitioners in medicine.

The situation in Canada is precisely similar to that set out by Commander Bainbridge as existing in the United States. The great war of nations has practically been brought to a conclusion, but the industrial war between the complicated machinery of modern civilization and the industrial or mechanical worker not only continues but is rapidly expanding and becoming a menace. The startling figures given in the paper convey, in a graphic way, the amount of maiming and impairment brought about by these forces, and illustrate most conclusively the necessity of continuing in civil practice the methods of physio-therapeutic treatment which have had such marked success in the repairment and adjustment of the injuries of war. Previous to the war treatment by physio-therapeutic methods, while recognized as being of some value, were largely left by the physician and surgeon to the osteopath, the chiropractor and the charlatan. The results obtained in the improvement of war injuries by careful and persistent effort along physio-therapeutic lines have been, to say the least, surprising, startling and, in some instances, almost incredible. If corresponding results are now to continue to be obtained in the case of industrial injuries and impairment, the medical profession must put themselves actively in touch with all necessary forms and methods, be prepared to advise and skillfully discuss with the trained operator the proper lines of treatment, and thus add to the armament of the profession this most valuable asset. When the demand is created in the civil hospitals for the appliances necessary to properly carry out all lines of treatment, the hospitals will, if from no other than commercial motives, not be slow to provide the equipment.

This admirable paper has brought out in a most pointed way the advantages of this well-known method of treatment under war conditions and has shown how readily and rapidly it can be adapted to industrial conditions of peace; and it remains with the profession to carry these to a fulfilment.

COMDR. R. F. SHEEHAN, M. C., U. S. N.: The paper of Dr. Bainbridge is of particular interest. It is gratifying to have a surgeon of his reputation devote an opportunity to this subject which has received such inadequate attention.

Had the profession sooner realized the import of physio-therapy, we would never have had the evergrowing influx of mediocrities, who under various oddly concocted denominations pose as being qualified to treat any pathologic condition and prey upon the unsophisticated public who are incapable of determining their limitations. Their mere

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existence connotes some necessity for the methods which they utilize.

As a neurologist, I have been much handicapped in caring for the many men returned from abroad with neural injuries and paralyses, by the lack of proper facilities for these methods of treatment, and by the absence of workers qualified to carry them out. In these cases and in the psychoneuroses, physio-therapeutic methods are not only imperative to assure the best degree of result, but in the injuries are extremely important in sustaining the morale of the patient by convincing him that there is continued interest in his condition and enabling us to most profitably occupy the interval—sometimes long—in which the time element alone governs recovery.

In view of the well-known utilization of these methods by institutions for mental disorders, it is hardly necessary for me to state that in my own field they are the greater part of our armamentarium for constructive treatment.

I trust that the effort of Commander Bainbridge will be productive of results in stimulating professional interest in the matter.

CAPT. F. L. PLEADWELL, M. C., U. S. N. O.: Commander Bainbridge is to be congratulated upon his thorough presentation of this important subject. Physio-therapy has been neglected by the medical profession, and, as a consequence, its practice has fallen largely into the hands of individuals lacking proper medical education. We must recognize that this specialty, as well as others, is better administered by those who have first had a general medical training. The experience gained in the war which has demonstrated the great value of the different curative methods included under the term "physio-therapy," should now be applied more universally in civil practice. Unfortunately, the disabilities resulting from the war will call for treatment for years to come, but stiff joints, palsied muscles, deformities and paralyses occur not infrequently as sequels or complications of injuries sustained in civil employment, and are deserving of the same treatment which has been applied so successfully to similar conditions following war wounds.

It is unfortunately true that a somewhat extensive and elaborate equipment of apparatus is required for all forms of treatment, but if my memory serves me right, in some of the institutions of this character visited abroad, excellent results were being obtained with apparatus costing in the neighborhood of $2,500. It should be emphasized, however, that while whirlpool baths, diathermy, ionic medication, high frequency current, etc., all have their place in the application of physio-therapeutic methods, one of the most important, perhaps the most important instrument of treatment, the human hand, is everywhere available. What we need in this direction is proper education of

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the masseur (or masseuse) and proper appreciation on the part of the surgeon of what can be accomplished by massage in appropriate cases.

I am in entire accord with the essayist when he calls for the organization of some scheme of coöperation whereby the facilities of civil hospitals will be made available automatically, upon the outbreak of war, to the sick and injured of the services. But is it reasonable to expect this? Many of our hospitals are even now quite unable to receive all the civil cases who apply for admission or treatment, and it should be realized that the need of the civil population for hospital accommodation will not diminish in time of war; on the contrary, it may increase. I do not mean to say that some scheme of coöperation will not be feasible, but whatever plan is projected, cognizance should be taken of this situation.

MAJOR CORBUSIER: Gentlemen, I am afraid that Commander Bainbridge's fourteen points covered everything. I have been interested in this work of physio-therapy for some time and am greatly pleased to see Commander Bainbridge so interested in it, but am not surprised, inasmuch as he has had experience in this work and has seen its importance. Many men do not realize the real necessity for physio-therapy and the medical colleges are much to blame, for they make no mention of the benefits of this treatment. Further, it has been very difficult, heretofore, to obtain trained workers competent to take hold.

How often is any form of massage or hydro-therapy prescribed for the stimulation of circulation, releasing of adhesions, contractures and the prevention of ankylosis, and so forth? How many fracture cases have we immobilized to such an extent that the resultant limitation in the motion of a joint has been the greater disability? Commander Bainbridge brought that to our attention, and I fully concur in his opinion. Ever since I have seen the ambulatory treatment—active and passive motion—of infected joints by the Chinese, I have been greatly impressed.

In General Hospital No. 3, of which I was Chief of Reconstruction Section, the principal methods from which the greatest value was derived were massage in various forms, electricity, and active exercise in the gymnasium. The hospital was essentially an orthopedic one and was equipped with various apparatus, and there was a special director for each line of work. Treatment of each case was arrived at by consultation between the orthopedic surgeon and the director of physical reconstruction and also the director of the department of physio-therapy. All healed cases requiring further operation for correction of deformity were given at least two months' course of massage and hydro-therapy. In amputation cases the stumps were carefully massaged before they were healed entirely, and in addition the patient had

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active exercise in the gymnasium. We could not have gotten along without these treatments in the physio-therapeutic department. A great deal of our work was with those many cases from the A. E. F. that had been immobilized too long. I do not mean to belittle the importance of splints, but I have seen many cases where they have been left on too long.

I have also found that by active motion in cases of injury, lime salts are deposited more quickly, and this enables wounds to heal with greater rapidity. In other words circulation is stimulated.

There is no doubt that we have been far behind European countries in our use of physio-therapy—from both the curative and preventative standpoint. We will fall short of our duty to our patients and to the people at large if we do not introduce the principles we have learned, by experience in the past war, into our own civil hospitals and communities. As Commander Bainbridge suggested, no large hospital should be considered completely equipped unless it possesses all the means for the application of physio-therapeutic measures. I will add to that and say that every hospital, large or small, should have at least some means of bringing about the functional restoration of surgical and medical cases. Moreover, no medical college should be considered complete without ample means for training in all forms of physio-therapy.

We are trying to put through a law for the universal military training—and this means physical training—of our countrymen. I am a thorough believer in this, for it will give us thousands and thousands of physically fit men.

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THE ARMY MEDICAL MUSEUM[1]

By Colonel CHAS. F. CRAIG, A.M., M.D.
Medical Corps, United States Army, Curator

(With five illustrations)

THE following contribution is prepared for the purpose of informing the officers of the Medical Corps and the Medical Reserve Corps of the United States Army regarding the work of the Army Medical Museum during the recent war, and the plans which are contemplated regarding the future of this institution.

The Army Medical Museum was founded by Surgeon General William A. Hammond in 1862, Brigade Surgeon John Brinton, U. S. Volunteers, being placed in charge as Curator on June 4 of that year. Surgeon Brinton stated in his address to the Army Medical School on March 13, 1896,[2] "that the beginning of the Museum in August, 1862, was very modest, consisting of three dried and varnished specimens placed on a little shelf above the ink stand on the desk of the recently appointed Curator." From this "very modest" beginning, under the able instructions of Surgeon General Hammond and the enthusiastic coöperation of various surgeons of the army, the Museum expanded until in June, 1870, the collection had become so valuable as to merit the commendation of foreign authorities. On June 28, of that year, in the *Gazette des hospitaux civile et militaires*, Vol. 43, xliii, page 293, Dr. Berenger-Feraud of Paris stated "that the United States had done as much in the matter of an anatomical-pathological museum in five years as had been done in all of Europe in a century." In an article on August 11 of the same year, entitled "Science Schools and Museums in America," by Saint George Mivart, in *Nature*,[3] the following is stated:

> The Army Medical Museum contains a series of excellently numbered preparations of great professional interest, remarkable chiefly for its profuse exhibition of the effects of shot, shell, and other implements of war on the human frame. The material for this Museum was chiefly collected during the American Civil War. It may well be said that the Americans are a wonderful people. There are few other nations which would have been capable of so utilizing the results of a protracted internecine war as to make them available in after years toward the advancement of medical science and alleviation of human pain.

At that time the collections of the Museum consisted very largely of material obtained from battlefields of the Civil War, but since then a

[1] Read at annual meeting in St. Louis, Mo., October 13-15, 1919.
[2] History of the Army Medical Museum, D. S. Lamb, 1917, p. 57.
[3] *Ibid.*, p. 58.

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very large amount of material has been obtained from practitioners in civilian life, as well as from army surgeons in the tropics and in this country. The collection of the Museum at the outbreak of the recent war numbered approximately 48,000 specimens, of which approximately 14,000 were specimens of pathological material, 1,300 anatomical dissections and models, 13,000 slides of microscopic sections, over 15,000 photographs and negatives, and several thousand miscellaneous specimens.

It was early recognized, after the declaration of war with Germany, that the opportunity for securing valuable material illustrating the effects of disease and wounds upon human tissues would be almost unlimited and the Surgeon General promptly issued a circular requesting that such material be collected for the Army Medical Museum. A Museum Unit for service with the American Expeditionary Forces in Europe was organized and dispatched as soon as authority was received for this purpose, and this unit was instrumental in collecting a great deal of very valuable material as the result of the war. The hospitals in this country were circularized, and the response has been very gratifying in the way of pathological and histological material and microscopic preparations illustrating the lesions of the various diseases occurring in camp life in this country. As a result of the activities of the Medical Department in Europe and this country, the Museum has more than doubled the collection that it possessed at the beginning of the war, so that at the present time the collection consists of over 100,000 specimens, of which a large percentage illustrates pathological conditions. From April, 1917, until July 1, 1919, there have been accessioned, in the Department of Pathology of the Museum, 9,960 specimens, together with 12,700 autopsy protocols. The accession numbers, which reach the total of 9,960, do not indicate, by any means, the actual number of specimens received at the Museum, as one accession number frequently covers several specimens, including histological sections, pathological organs, X-ray plates, etc., the accession number merely identifying the case. In reality, practically double the number of specimens have been received as shown by the accession numbers, so that it may be stated that approximately 18,000 specimens have been received in the Pathological Department of the Museum alone. In addition to these specimens, the Photographic Department of the Museum has received over 10,000 photographic prints showing the lesions of disease, the results of surgical operations, and the medical activities of the Army at the front and in the camps in this country during the war.

The work of the Museum is divided into six departments: Department of Pathology and Accessions, Department of Moving Pictures, Department of Still Photography, Department of Wax Modeling,

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Department of Entomology, and the Department of Anatomical Art, and a brief résume will be given of the work accomplished by each department.

DEPARTMENT OF PATHOLOGY

This department has charge of collecting and preparing for the Museum specimens of pathology and other material illustrating the diseases of the soldier, the effects of wounds by various missiles upon the human body, and of the accessioning of all specimens received by the Museum and the preparation of all specimens for exhibition purposes. Each specimen, after it is received, is given an accession number and briefly described upon the catalogue card which is filed for future reference. The file also contains the protocols, clinical histories, photographs, and other data relating to each case. The aim in the preparation and exhibition of all specimens is to afford a permanent source of medical instruction and research not only for the officers of the Medical Corps but for the general medical profession.

Another function of the Pathological Department during the recent war was the instruction of medical officers in the saving of material of interest from autopsies, and the methods of preservation and collecting such material. It was noted that many excellent pathologists had but a limited knowledge of this subject, and it was necessary, by a careful follow-up system of correspondence, circulars, bulletins and orders, to instruct them in the methods of collecting and preserving museum material.

From April 7, 1917, to July, 1919, 9,960 specimens were accessioned by the Pathological Department, together with 12,700 protocols of autopsies. The pathological specimens received consisted of material collected both in this country and in France, and the latter specimens illustrated well the peculiar diseases associated with trench life and the effects of gunshot and other wounds upon the body. From this country and from France a very valuable collection, illustrating the various stages of all types of pneumonia, was received, especially organs illustrating the pathology of streptococcus and influenza pneumonia. A valuable collection of tissues illustrating the effect of gas gangrene, was also received from France and is being prepared for exhibition, and much material showing the effects of the poisonous gases used by the Germans was collected and is now being studied by experts.

The material received since the outbreak of the recent war is so greatly in excess of the actual needs of the Museum, owing to duplication of specimens, that arrangements are contemplated for distributing as much of it as can be spared to medical colleges and societies and to

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research workers, for instructional and research purposes. In this way the Army Medical Museum will not only fulfil its function as a place for the preservation and exhibition of pathological material, but will also assist in the general medical education of the country.

In addition to the special work of preparing pathological material for exhibition and study, the Department of Pathology has had charge of the accessioning and arrangement for exhibition of all other material contributed to the Museum, as ordnance, sanitary models, apparatus used in the prevention and treatment of the diseases of the soldier, and miscellaneous specimens of general interest. A large amount of material other than pathological has been received, and when it is prepared for exhibition it will prove of great value in future years to army surgeons and the medical profession in general.

DEPARTMENT OF MOVING PICTURES

Some months after the declaration of war a department of moving pictures was established at the Army Medical Museum as part of the Instruction Laboratory. This latter organization is a field organization attached to the Museum and comprises not only the moving picture department but the Departments of Anatomical Art, Still Photography, and Wax Models. The Moving Picture Department was established for the purpose of producing moving pictures which would illustrate methods of treating diseases and wounds in our army, field operations, sanitary procedures, and other activities of the Medical Department This department was very active while it was continued and produced many excellent films, among which may be mentioned the following: "Fit to Fight," "Diagnosis of Tuberculosis," "Fighting the Cootie," "Mosquito Eradication," "Training of the Medical Officer," "Regimental Detachment," "Field Hospital Unit," "Ambulance Company," "Come Clean," "The End of the Road" etc. Some of these films are the best that have ever been made upon the subjects and are in constant demand not only by surgeons of military commands but by medical schools and medical associations throughout the country.

Owing to the lack of appropriations and personnel, the Moving Picture Department was closed March 1, 1919, in so far as the manufacture of moving-picture films was concerned, but a circulation department has been continued which keeps in circulation a considerable number of the films that have been produced. These films are constantly in use, being loaned to various medical societies, colleges, schools, etc., for a period of three weeks, after which they are returned to the Museum and again loaned. The films have been of very great value, not only to the Medical Corps but to the general medical profession of the country,

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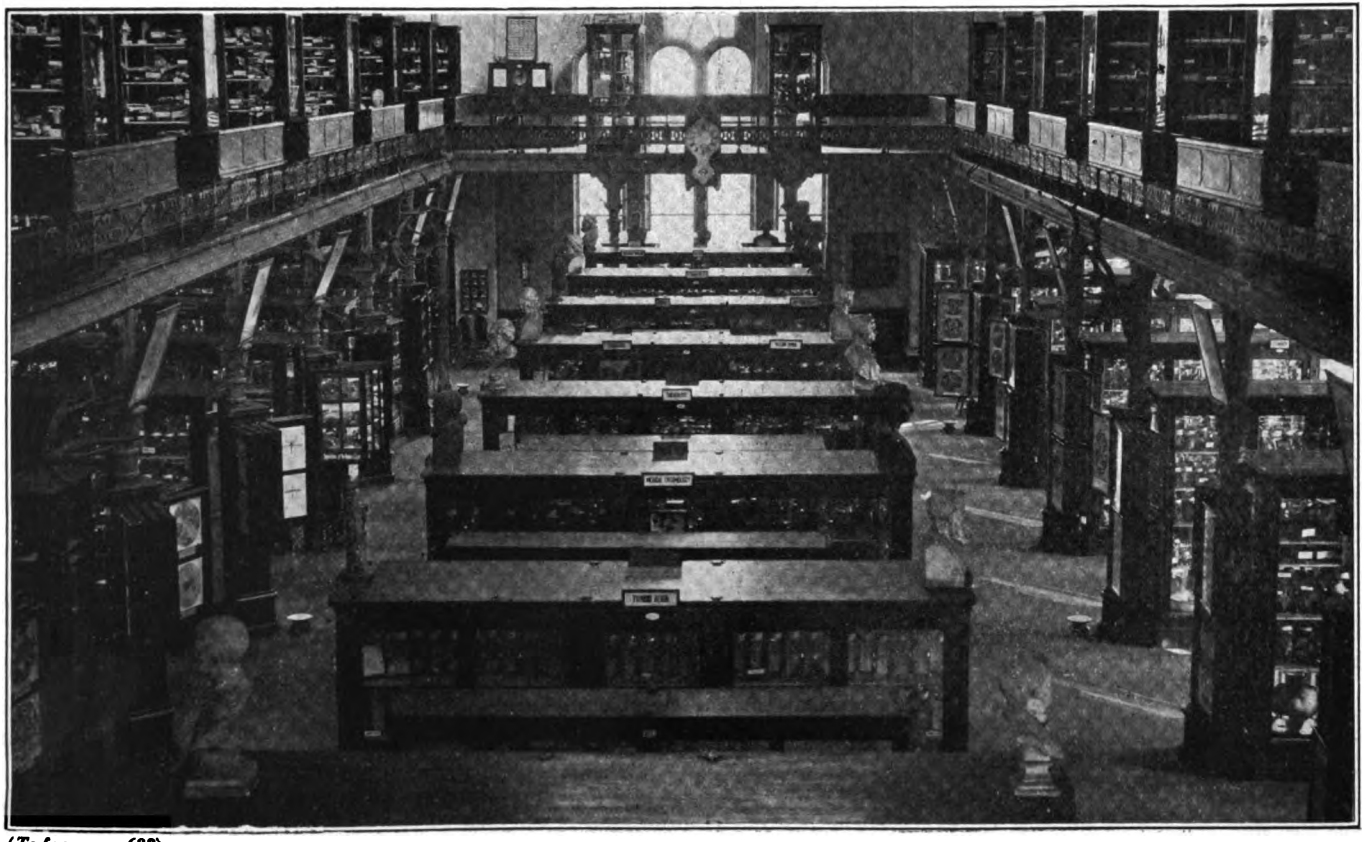

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MAIN MUSEUM HALL FROM GALLERY.

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FIG. 2.—EXHIBITION ROOM. PHOTOGRAPHS AND PAINTINGS.

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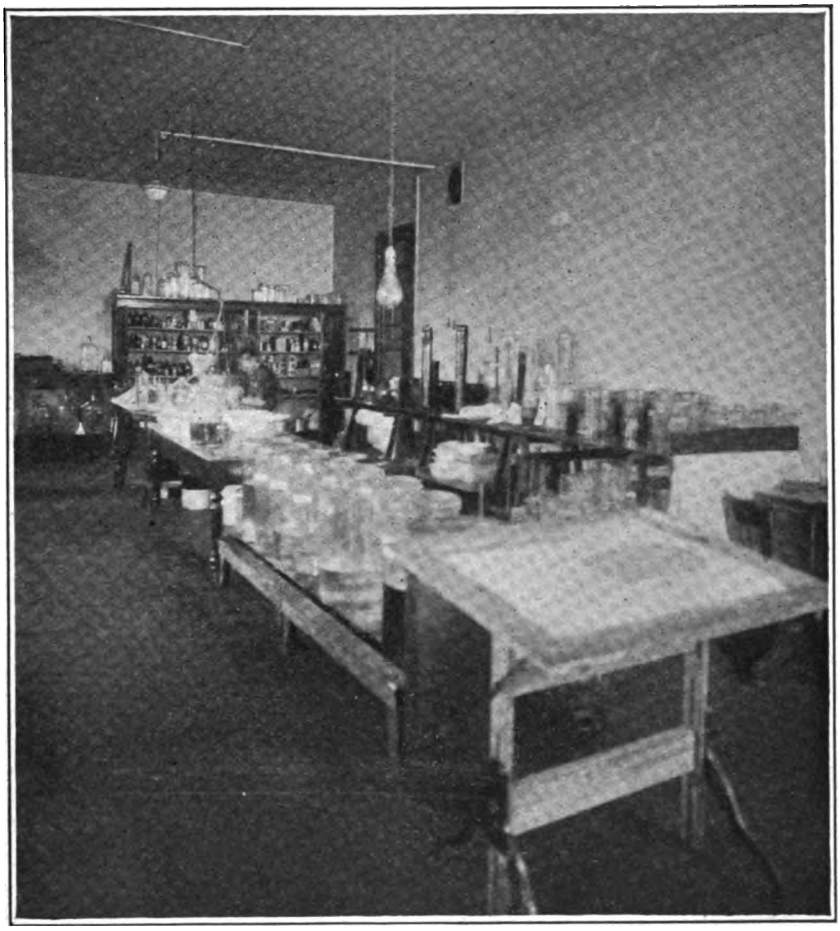

FIG. 5.—LABORATORY ROOM. GROSS PATHOLOGY

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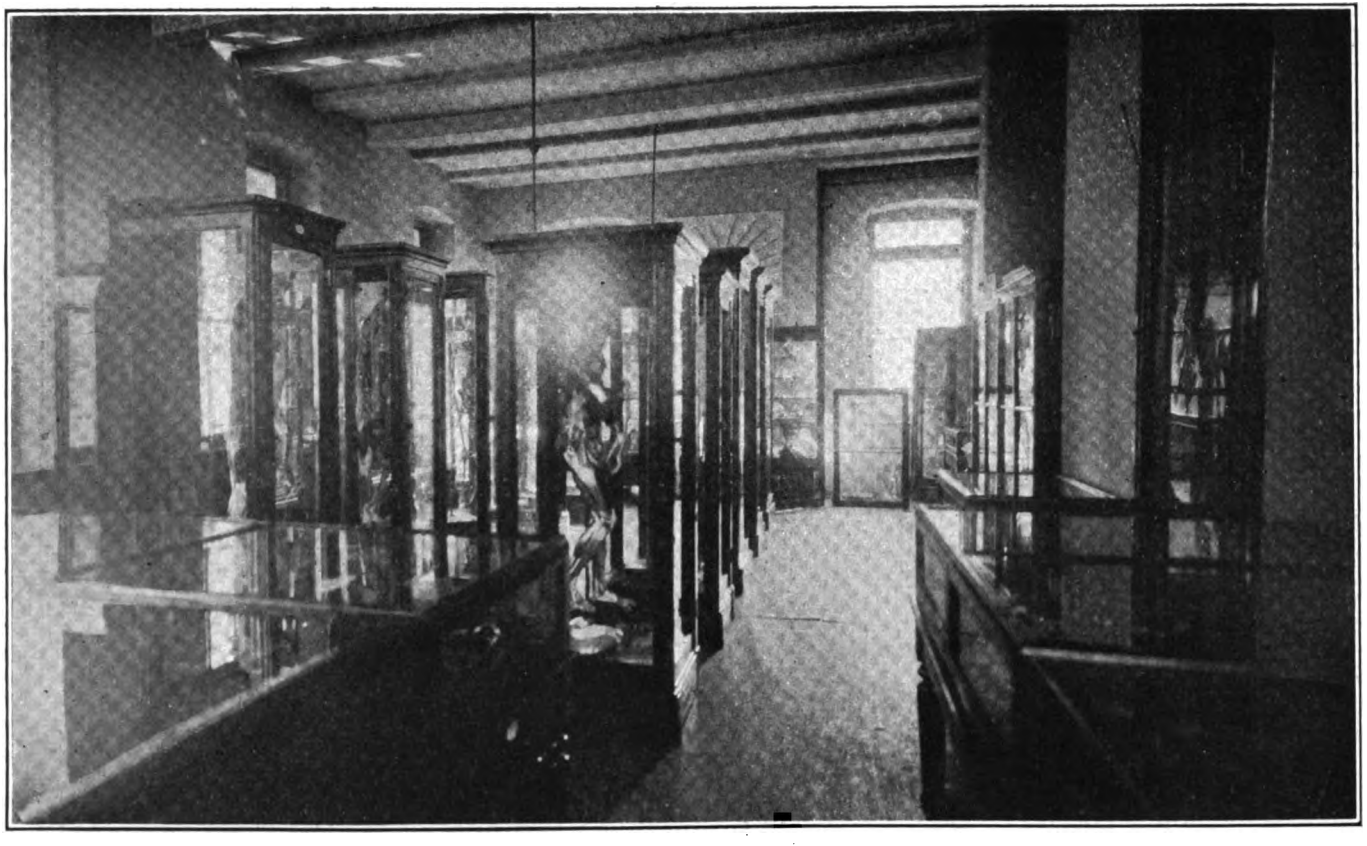

FIG. 3.—EXHIBITION ROOM. ANATOMICAL MODELS.

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FIG. 4.—LABORATORY ROOM. HISTO-PATHOLOGY.

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and are greatly appreciated by the medical profession. It is hoped that in the future arrangements will be made whereby the making of moving-picture films will be resumed, as it is believed that in no better way can the Medical Corps represent its activities to the general medical profession and the public than by the production and exhibition of films illustrating these activities.

DEPARTMENT OF STILL PHOTOGRAPHY

The Department of Still Photography has accomplished very valuable work since the outbreak of the war. The photographic section of the museum unit sent to France collected thousands of negatives and prints illustrating the activities of the Medical Department in the field, and the department at the Museum has reproduced thousands of enlargements, prints, and photostats, illustrating not only pathological material but the general activities of the Medical Department in posts and in the field.

DEPARTMENT OF WAX MODELING

Reproduction, by means of wax models, of wounds, diseases of the skin, and of the results following plastic operations, is one of the most valuable methods of preserving the records of such cases for instruction purposes. The Department of Wax Models of the Museum has prepared over 80 wax models illustrating the conditions mentioned, and the wax modelers attached to the museum unit in France reproduced a large number of models illustrating plastic surgery and other conditions. The models produced illustrate not only conditions arising from the wounds and accidents connected with the prosecution of the war, but there are many valuable models of dermatological lesions and other disease conditions. These models, added to those already in the possession of the Museum, comprise one of the most valuable and perhaps the largest collection of wax models in any museum of any country.

DEPARTMENT OF ENTOMOLOGY

The Department of Entomology has charge of the collection, identification, and classification of mosquitoes received from various posts and camps in this country and in our insular possessions. This work has been of the greatest service to the Division of Sanitation of the Surgeon General's Office, as showing the prevalence of disease-bearing mosquitoes in certain regions and their relation to prevalent diseases. The department has also prepared a large number of insects for exhibition purposes in the Museum and supplied the Army Medical School with practically all of its material for the teaching of this subject.

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DEPARTMENT OF ANATOMICAL ART

During the war several artists were assigned to duty at the Museum for the purpose of reproducing in colors pathological lesions observed in specimens received here, and approximately 50 paintings illustrating such lesions were prepared, together with a large number of drawings illustrating various stages in surgical operations performed at the Walter Reed General Hospital and other places. In addition to the artists at the Museum, some of the larger hospitals were supplied with an artist from the Museum force, and from these hospitals very valuable drawings and paintings have been received, illustrating the work done, especially that in plastic surgery and injuries of the bones. The artists attached to the Museum unit in France prepared several hundred colored and uncolored drawings illustrating wounds and diseases occurring in the American Expeditionary Forces and these have been received at the Museum, catalogued, and filed in such a manner as to be available for research or for inclusion in the Medical and Surgical History of the War.

THE ARMY MEDICAL MUSEUM UNIT IN FRANCE

In January, 1918, the Surgeon General requested authorization to send a medical museum unit to France for the purpose of collecting museum material in camps and at the front in that country. Upon approval of this request, a museum unit was formed and was placed in charge of Col. Louis B. Wilson, Medical Corps, U. S. A. This unit accomplished valuable results in the face of great obstacles. It was first necessary to build up an autopsy service in the A. E. F. Unfortunately, pathologists were rare, and it was only after great difficulty that it was possible to secure the material that was requested. Preservative chemicals were hard to get, and this caused great delay in the collection and forwarding of specimens. Despite the lack of personnel, equipment, supplies and transportation, it was possible within a period of a few weeks to collect over 2,000 pathological specimens relating principally to war wounds and gas poisoning, and it was possible to obtain, after a great deal of trouble, a representative collection of the lesions produced by the gases used at the front. The epidemic of influenza resulted in many good specimens being obtained of the pneumonias following this disease, and a fairly good collection of brain, cord and nerve lesions was made. In addition to the pathological material collected by this unit, a considerable amount of ordnance material, including small arms, machine guns, and the various missiles and ammunition used by the nations in the war, were forwarded to the Museum. A representative collection of trench knives, helmets, and defensive armor was also collected by the unit. The effect of missiles upon defensive armor, as helmets and

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breast plates, is well shown by the collection forwarded by the unit, and will be available for study not only by medical officers but by the officers of the Ordnance Department and other departments interested in the subject.

The photographic section of the museum unit accomplished most valuable work in France. This group produced 35 casts of surgical cases, over 200 drawings and paintings, and over 1,000 photographs of technical subjects. In September, 1918, the museum section was charged with the duty of coöperating with the Signal Corps in the making of photographs for the Medical and Surgical History of the War. The negatives made by our photographers were printed and filed in the Central Laboratory of the Medical Department, and there has been transmitted to the Museum over 10,000 still pictures, properly titled and cross indexed. In addition, over 40,000 feet of moving pictures of surgical and medical subjects were completed by this division.

A large amount of the material collected by the Museum unit in France is still to be received, but that already received evidences the great value of these collections to the medical profession in general, and especially to military surgeons.

THE FUTURE OF THE MUSEUM

The crying need of the Army Medical Museum at the present time is room for the display of the material which is available for exhibition purposes and for study. The present building is occupied not only by the Museum but also by the Surgeon General's Library and is totally inadequate in size for the purpose of housing both the Museum and Library. In order to effectively display and make available the material already collected in the Museum, a building two or three times the present size is required, and it is hoped that the plan for the establishment of a great medical unit adjacent to the Walter Reed Hospital, which will include a separate and suitable building for the Museum, will receive the approval of Congress within a reasonable time.

If such a building were available, the Army Medical Museum would not only form a great teaching institution for the officers of the Medical Corps, but would also be able to offer to the medical profession of the United States one of the finest collections of pathological and anatomical material for research and study that has ever been assembled at one place. The value of this institution as a teaching institution cannot be overestimated, and was recently called attention to by Col. Charles H. Mayo in an article entitled "Educational Possibilities of the National Medical Museum." [4]

[4] Jour. A. M. A., 1919, vol. 73, pp. 411–413.

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Until quite recently all of the collections of the Museum have been open to the public, but this policy is not thought to be to the best interest of the service, in that exhibitions of pathological material, very largely secured from autopsies upon soldiers, are not thought suitable for general public exhibition. The public at large is unable to understand the nature of the lesions shown by these specimens and, therefore, can derive no benefit from their observation. In addition, unless they are carefully explained, they cause only disgust and horror in the minds of the laymen and produce an unfortunate effect in securing autopsies. In view of these facts, an effort is being made to segregate the purely professional material in the Museum in such a way as to be only available to physicians, medical students, veterinarians, dentists, and research workers interested in medical science. This has been accomplished by removing from the main floor as much of the pathological and anatomical material as possible and placing it in the gallery and in rooms where it can be studied according to the subjects represented. Pursuant to this policy, the Museum now has rooms devoted to gross pathology, wax models illustrating skin diseases, anatomical models and dissections, and the historical development of microscopes and surgical instruments. By this arrangement all material relating to one subject is collected in separate rooms where it can be studied at leisure, and a bird's-eye view of the entire subject secured without difficulty.

The space vacated on the main floor of the Museum has been filled with material of general public interest, as specimens of ordnance, missiles, gas masks, sanitary appliances, and models used in the recent war, and it is planned to include in the exhibit, which is open to the public, a complete set of models of sanitary apparatus used in the army in the prevention of disease. This room will also contain models, paintings and photographs illustrating the diseases common to military and civil communities, as typhoid fever, dysentery, tuberculosis, malaria, etc., accompanied by explanatory legends which will explain the exhibits to the public. In this way the Museum will become not only a teaching institution for medical officers and the general medical profession, but will also be most valuable in the instruction of the general public in hygiene and preventive medicine.

It is planned to furnish a limited amount of space for research workers who desire to study special subjects in pathology at the Museum. Owing to the large number of duplicates which have been received, there is a vast amount of pathological material available for research workers, and it is the policy of the Surgeon General's Office to encourage research workers in universities and in the service in the study of the special subjects in which they may be interested, by supplying material. Owing

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to the lack of room it is impossible to furnish working rooms for research purposes at the present time, but it is hoped that, if the new museum building is approved, a limited number of rooms to be devoted to this purpose will be available.

The training of enlisted men in pathological technique and museum work is a natural function of the Museum, and plans are being made to have an enlisted detachment assigned to the Museum for this purpose and to assist in the work of preparing the thousands of specimens received during and since the war for exhibition and study. The lack of properly trained technicians in museum work was keenly felt during the war, and, if the facilities as a training school in this line offered by the Army Medical Museum are taken advantage of, there should be no lack of such technicians in the future.

In conclusion, I would call attention to the fact that the Army Medical Museum is one of the few agencies that intimately connects the Medical Department of the Army with the general medical profession and the public. For this reason, aside from its great scientific value to the corps and the profession, it merits the enthusiastic support of every medical officer of the Army, and it is hoped that the same interest will be shown in the future of the Museum by the officers of the Medical Corps, both active and reserve, as during the war, as the future of the Museum rests entirely in the hands of the officers of the Medical Corps.

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A CONSIDERATION OF VARICOCELE AS APPLIED TO MEN IN THE NAVY

By Lieutenant PHILIP J. REEL
Medical Corps, U. S. N. R. F.

EARLY in 1918 Bloodgood drew the attention of the Medical Corps to varicocele as found in men examined for enlistment in the service. This communication set forth his reasons for the suggestion that the condition in most instances does not constitute sufficient defect for disqualification. Careful observation of those presenting varicocele after enlistment in the Navy would seem to substantiate Bloodgood's views and, in addition, direct attention to the fact that the condition cannot be treated efficiently without appreciating the individual characteristics presented by them. The routine rejection of men for fleet duty because of varicocele would seem to simulate the old method of disqualification for enlistment. Many individuals with this defect do not and never will develop sufficient symptomatology to warrant their rejection by a medical officer for duty at sea, while, on the other hand, there is quite a fair percentage of these men, classed as a whole, that will be either partially or totally incapacitated for duty unless relieved by some method of surgical treatment. Because of certain rules and regulations many men coming under the observation of those members of the Medical Corps assigned to surgical services present varicocele. This condition, though seemingly slight and of little importance in civil life, deserves serious consideration when applied to men who must at all times be able to perform any duty assigned to them. Many men, apparrently perfect, have found that they were unable to perform full duty because of the discomfort resulting from a varicocele which, prior to enlistment, had gone unnoticed. The character of their civilian life explains a great many of these cases.

Very soon after being assigned to the surgical service of one of the naval hospitals it became apparent that it was not satisfactory to treat by routine procedure every varicocele sent in for operation. Accurate data, together with a "follow up system," were recorded upon 89 cases treated personally during the year of 1918. Three general classifications were made very early in this series: (1) The patient presenting a varicocele which produces no psychic or reflex disturbances and annoys him only because of the weight and size of the scrotum and the traction upon the cord. This type of individual is easily handled. He complains of physical discomfort only and usually states that he has tried scrotal suspension and discarded it because of mechanical irritation. Rather pro-

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nounced elongation and dilatation of the veins is the rule and the subjective symptoms can readily be explained by the existing pathology. When advised that he can be relieved by operation and he submits, he convalesces to complete recovery without subsequent thought of his previous condition. (2) The patient with a small or medium-sized varicocele who has developed a neurosis the chief feature of which is fear of genital defect associated with a great variety of aches and pains, all out of proportion to the objective findings. It is certainly reasonable to suppose the physical defect in itself cannot account for the symptomatology in the otherwise normal individual. Marked modesty is usually displayed by this type of patient when he is examined, and he complains of great tenderness of the testis and cord when it is manipulated with the examining fingers. In most instances the scrotum is not so relaxed as in the more marked type. Much anxiety is entertained as to the present condition of the testicle and what will happen to it if the varicocele is operated. Frequently he will request transfer back to duty, stating that the affected side has ceased to trouble him. If this request be granted, he will promptly return in a few days with the same complaint as before. This man deserves serious consideration if he is to be saved from developing into a pronounced sexual neurotic. Careful questioning before physical examination as to how his varicocele bothers him, how long he has noticed its presence, whether he understands just what it is and how it is produced will very often reveal that he believes the veins to be intimately connected with the testicle and capable of affecting his generative powers. At times he will state that he is afraid an operation will cause damage to the organ. It is well here to explain the nature of a varicocele and the mechanical factors entering into the operative procedure for its relief. The more important anatomical relations should be explained in order to impress upon him that once operated he is sure of relief. It is a great satisfaction for this type to learn that no general anesthetic is needed and that the operation is not performed within the scrotum. Only when the patient fully understands his condition and the principle of its correction will he experience any benefit after being submitted to operation. (3) This patient has at most a medium sized varicocele which never has produced any symptomatology or inconvenience and probably never will so long as it remains untouched by operation.

Certainly many men with this condition complain of either physical or psychical disturbances, but these can be no criteria upon which to base an argument that each and every case should be operated. Inasmuch as this abnormality can in no way give rise to an acute surgical complication demanding immediate operative intervention as a life-saving

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measure, it would seem more advisable to allow such a man (type 3) to continue until such time as he may give rise to sufficient cause for relief by operation. Careful observation has revealed that certain of these individuals will develop, if operated, a sexual neurosis characterized by a great variety of subjective symptoms which increase with time and are frequently used as a plea for excuse from full duty.

In but two cases was it deemed advisable to dissect the veins from the scrotum. Both of these cases resulted in painful scar tissue replacement involving the ligated stumps. There seems to be no question as to the advantages of the inguinal type of operation. The control of hemorrhage is absolute, the resulting connective tissue replacement is minimized, the chance of testicular trauma is nil, the danger of infection is no more than that of herniotomy and injury to the vas is negligible because of its easy recognition within the canal.

Local anesthesia is the method of choice and the nontoxic preparations made up in 0.25 per cent solutions work very satisfactorily. The external ring is determined by palpation and the skin injection started a little below and extended upward over the canal parallel to Poupart's ligament for a distance of about three inches. After incision of the skin and superficial fascia all small points which persist in bleeding are caught and ligated with fine catgut, thus insuring a dry field and obviating the presence of instruments, the drag of which tends to produce pain. Retraction of the edges of the incision will reveal the external ring and the aponeurosis of the external oblique. The size of the ring, its laxity, and the ease with which the cord can be delivered will determine whether the margins shall be injected and cut or not. Grasping gently the sheath of the cord, a small amount of the solution is injected and the incision made longitudinally. The veins are next lifted out and the sheath stripped downward with a blunt instrument. Usually the vas and artery of the cord will remain with the sheath, but they should always be identified by sight and touch. That portion of the vein to be removed is crushed at both ends with a hemostat, ligated and excised. One of the ligatures is now threaded upon a needle, and the stumps are transfixed with one or two stitches, after which they are again tied and returned to the sheath. The external ring is repaired if cut and the fascia and skin closed in the usual manner.

A slight departure from this routine was tried in six cases. When the veins of the cord are snugly imbedded in fat and present no marked involvement within the canal, they may be delivered and arched across a bridge formed by sewing a portion of the fascia together under them. This causes a considerable reef to be taken in the length of the veins, and subsequent contraction apparently takes the place of ligation.

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A sterile dressing is applied and held by a spica of the groin. The scrotum is elevated with a bridge of adhesive tape fastened between the thighs. The patient is kept in bed for at least ten days. Careful attention to this detail will tend to reduce postoperative pain and swelling.

SUMMARY

1. Varicocele as found in men in the service deserves more consideration than in civil life.
2. Three general types are encountered.
3. Serious consideration should be given those patients of neurotic tendency or those already presenting definite psychical and reflex disturbances.
4. Most evidence seems to be in favor of the inguinal type of operation.

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THE PATHOLOGIC SERVICE OF THE AMERICAN EXPEDITIONARY FORCE[1]

By Colonel LOUIS B. WILSON

Assistant Director, Division of Laboratories, A. E. F.

Introduction.—The technical work of the Laboratory Section of the Division of Laboratories and Infectious Diseases was so modified by the stages of developmental organization and by the incidence of epidemics and hostilities that it may be divided roughly into four periods:

1. From the landing of troops, June 10, 1917, to November 30, 1917, about which date a large number of cases of pneumonia developed.

2. From December 1, 1917, to May 31, 1918, when the hospitals of the A. E. F. began to be concerned most actively with wounded soldiers following the heavy German offensive of May 28.

3. From June 1, 1918, to November 30, 1918, the period of serious epidemics and of greatest battle activity, during which time the laboratory was concerned largely with cases of enteric disease, influenza, and with recently wounded patients.

4. The period of demobilization from December 1, 1918 to May 15, 1919.

The first period, from June 10, 1917, to November 30, 1917, was one of tentative organization in which the laboratory staffs were for the most part doing the clinical pathology incident to ordinary illness and accidents in a small body of troops in the S. O. S. or in training. The Wassermann service was begun in September, 1917. In the few laboratories then operating (4 camp hospitals, 8 base hospitals and 2 section laboratories) a small but important autopsy service was begun. Very meager data concerning the technical laboratory work of this period are available since no monthly reports were made.

In the second period, from December 1, 1917, to May 31, 1918, laboratories in twelve more camp hospitals, three evacuation hospitals, ten more base hospitals and the Central Medical Department Laboratory began to function, and the organization of the Division of Laboratories and Infectious Diseases was perfected, thus greatly increasing the facilities for all types of technical work. Early in this period epidemics of pneumonia, diphtheria, scarlet fever and meningitis taxed these facilities to their full capacity for routine clinical and bacteriologic examinations. At the end of this period the system of monthly laboratory reports was begun, but the available information for most of the period is quite incomplete.

[1] Abstract of chapter written for the History of the Medical Department of the United States Army, 1917–1919.

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The beginning of the third period was marked by the German offensive, May 28, 1918, in the Chateau Thierry district, which brought large numbers of American wounded into the hospitals. The Medical Department, on the laboratory side as well as on the administrative, clinical and surgical sides, was then still greatly undermanned. So great was the need for medical attention that in many instances all laboratory officers were diverted from laboratory work to the more direct care of the wounded. At no period from this time on until the signing of the armistice were there half enough laboratory officers at work in the laboratories to make the necessary routine technical examinations, while research was wholly out of the question. However, by working without regard to fatigue or the day's length, as did their fellows in the medical and surgical divisions, they succeeded, besides helping out the other divisions, in organizing and developing their laboratories, in doing most of the absolutely essential clinico-pathologic routine work, and in meeting emergencies such as making large numbers of bacteriologic examinations and autopsies incident to battle casualties and epidemics of enteric diseases, influenza, diphtheria, meningitis, etc. This was accomplished in most instances, except for certain 8-chest transportable outfits obtained in England, with equipment so inadequate as to have been considered utterly impossible under peace conditions. If the amount and character of work done during this third period is studied and the meager personnel and equipment is considered, only astonishment is elicited at what was accomplished. By November 1st the total number of laboratories in operation had risen to nearly 300, the personnel was advantageously distributed, officers had learned to really "make bricks without straw," a fine *esprit de corps* had developed, and, had the war lasted a few months longer, the magnificent team-work would have triumphed over every obstacle and resulted in the greatest system of laboratories that the world has ever seen. This third period of the laboratory activities of the A. E. F., *i. e.*, from June 1, 1918, to November 30, 1918, will forever stand as a monument to the ability of the American laboratory man to get results regardless of conditions.

The available information concerning the technical work for this period is fairly good. In May, 1918, a standard form (No. 5) for laboratory reports to the Director of the Division was produced and, beginning with June, 1918, this report was received monthly from almost all laboratories in operation in the A. E. F. This form, which was intended primarily to supplement personal inspection from the Office of the Director of the Division, presented sufficient clinical information concerning the activities of each hospital to enable the reviewer of the report to determine something of the character and amount of work

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which should have been done by the laboratory and the personnel available for its accomplishment. The laboratory activities were divided into six groups as they were ordinarily distributed, when distribution was warranted, among the personnel of the laboratory. All attempts to determine the clinical incidence, as of infectious diseases, were purposely omitted from the report since it was believed that these more properly belonged to Special Reports of the Section of Infectious Diseases, etc. The number of "positive" examinations in certain diseases was given merely to aid the reviewer in determining whether the clinician was under-using or over-using the laboratory. The careful review of each report immediately upon its receipt and, if necessary, the return of a critical indorsement thereon, was tedious labor but did much to improve the weak points in the service.

The signing of the armistice marked the beginning of the fourth period of the laboratory service and, regrettably, in some respects the period of its dissolution. Many laboratory officers in civil life, unlike their fellows in clinical medicine and surgery, had not been enjoying large incomes and had left their families inadequately provided for. Many of them were dependent on teaching and hospital positions which are filled at stated periods, and which cannot be resumed at any time of year as may a private practice. Many laboratory officers requested leave to return with their hospital organizations, a request which could not well be refused, though the laboratory personnel was still far below that of any other medical service. At the same time typhoid fever made its appearance in a number of organizations, rendering necessary extensive bacteriologic examinations, troops in training areas were being very thoroughly examined for venereal diseases, and the concentration of troops at embarkation camps and base ports resulted in potential danger-points which demanded a very great increase of laboratory service. Thus, as a result on the one hand of decreased personnel and on the other of increased service demanded, much of the technical service of the laboratory division, even in this final period, was done under considerable stress. Fortunately, however, early in this period the arrival and distribution of laboratory supplies had been greatly expedited, which, coupled with the transfer of material from organizations being demobilized, greatly improved the physical conditions under which the work was done.

Clinical Pathology.—In the field of clinical pathology the laboratory officer, by urinalyses, blood cell counts, etc., assists the attending medical officer and surgeon by furnishing information, which aids in determining the physical condition of the patient. In the examination of feces for parsites and ova, blood for malarial parasites, sputum for

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tubercle bacilli, spinal fluid for meningococci, preparations from venereal lesions for gonococci or treponemata, etc., his word is final if his findings are positive. But in all of these studies he stands in the relationship of consultant to the attending medical officer or surgeon and is dependent upon them for the receipt of specimens and for notification of their need of his services. Hence the amount of clinico-pathologic work done in a hospital which is properly manned and equipped depends very largely upon the hospital clinicians. Not all hospitals in the A. E. F. were manned by such officers well trained in the selection of cases in which clinico-pathologic examinations might be of assistance, nor were they all sufficiently trained in interpreting the results once they were obtained. In some instances serious diagnostic errors were made which might have been prevented by even a urinalysis; in others the laboratory was called upon to make large numbers of difficult examinations in the search for the specific cause of a disease which was scarcely even suggested by the symptoms. Personal supervision by medical and surgical consultants did much to improve the clinical services in this respect, but were obviously inadequate to cover with sufficient detail the field of nearly three hundred hospitals. It is believed that commanding officers of hospitals might well give more attention to the preservation of the proper balance between their several professional services. In hospital centers the placing of the laboratory officer of the center on the headquarters staff greatly increased the efficiency of the laboratory service of the center and made for the better coördination of the laboratory work with that of the other professional services.

The clinico-pathologic service of the first period up to November 30, 1917, constituted the bulk of all laboratory work, though it was far from large. During this period the number of patients in hospital was small, since the troops were mostly in the S. O. S. or in training areas, and clinicians were thus able to study their cases carefully and to utilize the laboratory facilities to good advantage. Many of the patients in hospital during this period were suffering from acute infectious diseases of respiratory origin, though true pneumonias did not reach a high rate till December. A very high venereal rate occurred in November, 1917, making necessary many routine laboratory examinations in this field. The laboratory records for this period, however, are very meager since regular monthly reports were not made.

The clinico-pathologic work for the second period, from December 1, 1917, to May 31, 1918, was similar to that of the first period. The epidemic of pneumonia, starting in the fall of 1917, gradually subsided, but a relatively large number of patients with other diseases, particularly meningitis, scarlet fever, diphtheria and measles, were hospitalized, and

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on these a large amount of clinico-pathologic work of a routine character was necessary. The relatively high venereal rate in December, 1917, dropped materially toward the end of the second period.

The total amount of clinico-pathologic work done during the first and second periods was low in relation to the number of cases in hospital and to the number of both commissioned and enlisted personnel. This was due to obstacles in housing, lack of equipment, untrained enlisted personnel, and in some instances to "overtrained" commissioned personnel. Many of the first base hospitals in the A. E. F. were manned on the laboratory side, as well as in the other professional departments, by highly trained specialists. Many of these had been concerned in their recent civil experience only with teaching or research, and it required a considerable period for some of them to readjust their ideals so as properly to evaluate simple routine clinico-pathologic examinations, as of urine and blood.

For the third period, from June 1, 1918, to November 30, 1918, the records are fairly complete, though during this period the laboratory service, being undermanned to the extent of only about 40 per cent of its normal strength, was so greatly overworked as to make the keeping of detailed records very difficult.

During the fourth period, from December 1, 1918, to May 15, 1919, though, as already pointed out, there was at first slight but soon a marked decrease in trained laboratory personnel, the continuance of influenza and the outbreak of numerous small epidemics of typhoid fever, as well as the more careful venereal survey of all troops, made necessary a large amount of laboratory work.

Leucocyte counts showed a gradual increase monthly which failed to rise with the greatly increased number of patients in hospital and did not reach even an approximately proper proportion till February, 1919. This was most noticeable in the relatively small number of differential counts made and was probably due to failure of clinical officers to appreciate the importance of this diagnostic procedure, or their failure to insist upon the necessity for such counts.

Malaria examinations, which reached their highest number in August, 1918, were notable for their rarity, though they probably covered the necessary field more completely than any other laboratory procedure.

Examinations of feces for parasites and ova and for entomeba were altogether too few. There was little time for these during periods of great stress, but during the fourth period they might have been more generally done. It is unfortunately true, however, that laboratory personnel properly trained in the technique of these examinations was

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seriously lacking in the A. E. F. This defect is probably directly chargeable to lack of sufficient training in the subject in the medical schools of the United States.

Urine examinations were fairly numerous, but their distribution and quality were very irregular. In many hospitals the specimens were intelligently selected, properly collected and carefully examined. In some this was not true. In others very few examinations were made. Because of their number no variety of laboratory examinations are so likely to degenerate in quality through relaxation of vigilance at some step in the process as are urine examinations.

In examinations of sputum for tubercle bacilli similar relaxation is apt also to occur. Specimens which the laboratory officer knows are not intelligently selected or collected are apt to be superficially examined, thus rendering negative reports of little value. In some hospitals as many as four or five hundred specimens were examined with only four or five positives reported. It is true that these were intended as controls in cases of recovery from influenza and pneumonia, but it is feared that in many instances the lack of care in the collection of sputum and the lack of persistence in search for the bacilli, due to haste, made the negative findings of relatively little value.

The examination of gastric contents had a relatively small place as compared with such examinations in a large civil practice. Most of the individuals being young adults subject only to wounds and acute diseases, there was little necessity for the examination of gastric contents for the diagnosis of gastric ulcer or cancer. In addition, the X-ray was greatly depended upon in most suspected cases.

The occurrence of sporadic cases of true epidemic meningitis at widely separated points in the A. E. F. kept the whole medical department on the *qui vive*. While it cannot be demonstrated beyond peradventure that had no measures been taken serious epidemics of meningitis would have developed, yet it is probable that the early accurate diagnosis and the vigorous methods instituted in most instances immediately on the development of a single case served in large measure to prevent epidemics, since it is scarcely conceivable that of all the sporadic cases developing none would have been of sufficient virulence to have caused infection of contacts. In this service the laboratory officer rendered inestimable assistance to the attending medical officer.

Smears for gonococci showed a gradual monthly increase, though not reaching a fair proportion till February, 1919.

Dark field examinations for *T. pallidum* were considerably, though not sufficiently, increased after the armistice. It was difficult to find enough officers to make the large number of necessary dark field examinations in a competent manner.

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Except in the few instances noted above, the general quality of the clinico-pathologic examinations was good. A large number of clinicians had been trained in civil practice to expect and to interpret these examinations more or less intelligently. This counteracted the tendency on the part of some laboratory officers to turn this work over to untrained personnel. Just why macroscopic biologic diagnoses should be considered so much more abstruse—and therefore so much more worthy the attention of the laboratory officer than microscopic diagnoses, *e. g.*, of endameba or *T. pallidum*—is not apparent. Such was too often the feeling, however. Medical schools might well give more thorough training in the use of the microscope, especially in the study of *T. pallidum* in dark field preparations, of endameba, and of intestinal parasites and ova. Fortunately in the A. E. F., during the period of greatest stress, there was no necessity for any large number of any of these types of examinations.

A brief comparison of the number of clinico-pathologic examinations, with the total number of all examinations from month to month, and in the different types of hospitals may be significant in the apportionment of equipment and personnel for the various types of laboratories in future expeditionary forces.

In the headquarters laboratory and base laboratories of the S. O. S. sections the number of clinico-pathologic examinations totaled 22 per cent of the total number of all examinations in those laboratories. This varied slightly from month to month, but the general average may be taken as an indicator of the relative amount of clinico-pathologic examinations which was increased, as previously pointed out, by the fact that most of these central laboratories were associated with and doing clinical laboratory work for base or camp hospitals.

In base hospital center and base hospital laboratories, after the preliminary period of organization, the percentage of clinico-pathologic examinations settled down to a little more than 50 (average 53 per cent). This is probably a fair estimate for future similar organizations.

In camp hospital laboratories the percentage of clinico-pathologic examinations averaged slightly higher than in base hospital laboratories. It is believed that this percentage would have been very materially higher had not camp hospitals, in a number of instances, functioned as base hospitals.

The greatest variation from month to month in the percentage of clinico-pathologic examinations occurred in evacuation and mobile hospitals and averaged 55 per cent of the total examinations. This variation was due to the different conditions of "peace" and "combat" under which these organizations operated. Since in future expeditions

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it will be equally difficult to forecast the activities of these organizations, it would seem desirable that they be furnished with both personnel and equipment equal to any emergency.

In divisional laboratories the percentage of clinico-pathologic examinations was fairly even from month to month, averaging 49 per cent. It should not be forgotten, however, that the individual divisional laboratories varied greatly from month to month in their activities, some of them failing to function at all for several weeks at a time.

The total number of all clinico-pathologic examinations for all laboratories was 51 per cent of the total number of all examinations for all laboratories. This percentage varied from month to month, being slightly less during periods of battle activity and of epidemics of acute infectious diseases, owing to the increased necessity for bacteriologic diagnosis. Thus it would appear that equipment and personnel should be provided for future organizations under similar conditions sufficient to perform about 50 per cent as many clinico-pathologic examinations as of all examinations. It should be possible, however, to vary the type of examination at least 20 per cent in either direction. The limitation of equipment and the tendency to specialize the training of personnel along too narrow lines are both to be deplored. Emergencies must be met, and both equipment and personnel adaptable to emergencies should be provided.

Pathologic Anatomy.—At first thought pathologic anatomy would seem to have relatively little place in a military expeditionary force in which the laboratory's chief concern is in the control of infectious diseases and infected wounds. As it turned out, however, the unusual problems of diagnosis and treatment met with in the A. E. F. made work in pathologic anatomy one of the most important functions of the Section of Laboratories, and one of the most difficult to fill. The work may best be reviewed under the reported items of the macroscopic examination of operation specimens, histopathologic examinations and the making of autopsies.

In some laboratories the routine examination of material from surgical operations by the pathologists was an established practice, particularly after December, 1918. In many hospitals, however, this was neglected. This arose from two conditions: First, in civil life many surgeons had not previously learned the importance of the review of operative material by a pathologist for obtaining information which might be of value in the subsequent treatment of other cases or in the treatment of the same case; and second, during times of great battle activity the operating-room attendants were too busy even to transfer the specimen and necessary data to the laboratory. Commanding

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officers of hospital organizations should realize the importance of having all operative material reviewed by a competent pathologist as a routine procedure, and not just occasionally on request of the surgeon. This laboratory service is inspectorial in character and should be so considered.

Histopathologic examinations, requiring as they do considerable time and experience in their preparation, were made with great infrequency during periods of epidemics and of battle activity, when hospitals were crowded and laboratory personnel overworked. After the subsidence of the influenza epidemic and the cessation of hostilities, a number of hospital organizations began the histologic examination of tissues which had already been collected. As a routine procedure, the chief field for section study in military laboratories under conditions of warfare would seem to be the control of gross observations on operative material and autopsy specimens. If it were possible to provide carbon dioxide for the making of frozen sections, more of this work, particularly in the preliminary survey of operation and autopsy material, could be done than by the use of paraffine. However, since paraffine sections are necessary for examinations involving observations on bacteria, it would seem wiser to provide paraffine equipment as standard and frozen section or celloidin equipment only to meet special conditions.

A study of the distribution of the autopsy service by periods and in the several types of hospitals in the A. E. F. shows the following:

During the first period, to November 30, 1917, very few post-mortems were made in the A. E. F. The clinical service was extremely light, the attending medical officers and surgeons had time to study their cases with great care, and thus, even of the few patients who did die, the necessity for a post-mortem examination had not pressed itself on the attention of the attending officers. Of the post-mortems that were made, either incomplete records were kept or those that were kept were in some instances lost, so that there remain for the period but fourteen protocols in all which have been received in the Office of the Director of the Division of Laboratories. Most of these autopsies were made at Army Laboratory No. 1, Naval Base Hospital No. 1, and Camp Hospital No. 33. These autopsies represent less than 25 per cent of the deaths which occurred during the period.

During the second period, December 1, 1917, to May 31, 1918, though the conditions for the leisurely study of patients by clinicians and surgeons still continued, the latter had come to realize their difficulties in diagnosis and treatment and pathologists themselves had begun to take more interest in their work; thus autopsies increased in May to 57 per cent of the total number of deaths in the hospital. The percentage increase in April and May was further due to the fact that, April 2,

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Circular No. 17 was issued from the Chief Surgeon's Office, the first paragraph of which read as follows:

> 1. Autopsies are authorized in all cases of officers and soldiers and should be performed whenever possible. These autopsies shall be performed only by medical officers or authorized assistants. At the conclusion of the autopsy the body must be restored, as far as possible, to its original form.

Though by the end of May, 1918, there were in the A. E. F. 72 hospitals and laboratories, there were less than fifteen pathologists capable of making post-mortems and intelligently interpreting the results. This condition was due in part to the long neglect of autopsies in many civil institutions in the United States, with the inevitable reduction in the number of pathologists, and in part to the overshadowing status of bacteriology in military laboratories. The autopsy service in the Army in the United States had not been established as a routine procedure, but, on the contrary, autopsies were made only on the written authority of the commanding officer of the hospital. However, in the A. E. F. the need of a routine autopsy service, amounting in fact to professional inspection of the diagnostic and therapeutic measures of medical and surgical officers, became rapidly apparent during the summer of 1918. Surgeons were called upon to diagnose and treat, with little time for study or reflection, many gunshot wounds with the like of which they had had little or no previous experience. Even those who were well grounded in the general principles of surgery were forced to make decisions and institute treatment thereon without sufficient basis or study. As a result, there were errors in diagnosis and errors in treatment. The worst of these could be determined only by the pathologist. In like manner, attending medical officers, *e. g.*, in cases of war gas poisoning and especially in the widespread epidemic of influenza and pneumonia, were brought face to face with conditions with which they were totally unfamiliar, and were frequently forced to make diagnoses and institute treatment with a very meager knowledge of the facts. Here autopsies were of tremendous importance in securing for the attending man a knowledge of the pathologic lesions, which knowledge he could use in his diagnosis and treatment of subsequent cases. When, late in the fall of 1918 and the winter of 1919, numerous isolated epidemics of typhoid fever in vaccinated troops began to appear, the conditions were in many instances so obscure that the clinicians failed to make the diagnoses, the pathologist being the first to recognize the true nature of the disease when the patient came to the autopsy table.

Looking forward to some such possibility as occurred, the Director of the Division of Laboratories, in June, 1918, requested that ten competent pathologists be cabled for from the United States in addition

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to those coming over with hospital organizations. These arrived in due time and, being placed advantageously, assisted materially in improving the service. In addition the activities in forward areas were covered to better advantage by dividing the territory into sectors and placing, at Baccarat, Toul, Souilly and Paris respectively, competent pathologists attached to an evacuation or base hospital therein, with orders to act as consultants for the surrounding areas. In addition to these measures, the importance of autopsies was brought to the attention of laboratory officers and commanding officers of hospital organizations personally by inspectors from the Office of the Director of the Division of Laboratories, by letters, and by indorsements on monthly reports. As a result, the autopsy service rapidly mounted and, though there were never enough competent pathologists in the A. E. F. to cover the needs at all points, there being only about 200 pathologists out of 685 laboratory medical officers at the time of the signing of the armistice, yet the service did mount in August and September of 1918 to 92 per cent of all deaths in hospital. In October the total number of autopsies reached 3,896, though this was but 85 per cent of the deaths in hospitals, the autopsy service like every other being overwhelmed by the enormous number of deaths from influenza and the battle casualties of the Argonne offensive.

The distribution of autopsies among hospitals of the various types indicated where the stress for autopsy service came during the influenza epidemic and during battle activity. The greatest mortality was of course in the base hospitals. It is worthy of note that after July, 1918, many more autopsies were done in camp hospitals than in evacuation and mobile hospitals. This was owing to the greater number of camp hospitals and to the fact that many of them actually functioned as base hospitals. The lesson to be drawn from this experience is that competent pathologists should be provided for these organizations as well as for base, evacuation and mobile hospitals. On the other hand, it is doubtful whether conditions will ever warrant the performance of any considerable number of autopsies in filled hospitals by personnel attached permanently thereto. Here it is believed the necessary study of battle casualties, particularly of gas poisoning, can best be done, as in the French service, by centrally located laboratory officers provided with motor transportation for the rapid concentration at any point where gas casualties have occurred. This plan was attempted in the A. E. F., but for the most part failed for lack of transportation.

The general quality of the autopsies, in so far as their main object was concerned—namely, obtaining data for the immediate information of the attending physician and surgeon—was very high. This is es-

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pecially true when it is remembered that, under the unusual conditions under which both physician and surgeon were working, neither had any time to consider minute details of questionable importance. On the other hand, there were so many gross errors both in diagnosis and treatment, which were of such unquestionably vital importance in the care of the sick and wounded subsequently coming under observation, that in many instances it required only the opening of the body to enable the merest tyro in morbid anatomy to demonstrate them to the attending medical officer. In most instances the attending physician or surgeon was keenly alive to the benefit to the case of tomorrow to be derived from these observations. Now and then a cock-sure physician or surgeon ignored the findings of the pathologist until it became necessary to force them upon him. Here and there the commanding officer of a hospital, usually in a forward area under the stress of a huge inflow of battle casualties, failed to recognize the importance of the pathologist's inspection of the other professional services and placed his laboratory officer in charge of supplies or the mess, to the serious detriment of the diagnosis and treatment of the sick and wounded. There can be no question but that the uncontrolled surgery under such circumstances did great harm, which might have been obviated had the pathologist been permitted to exercise his proper functions and point out to the surgeon the gross blunders the latter was repeatedly making.

Judged from the standpoint of records for subsequent scientific study, the autopsy service was of very varied character. Only a relatively small proportion of laboratory officers had had an adequate preparation in the interpretation of lesions at the post-mortem table, and, of these, still fewer had been properly trained in accurately recording their observations. Trained clerical assistants and typewriters were almost unobtainable. The records of some of the very good men are exceedingly meager. In times of great stress this was true of everyone. Even one of the best pathologists, who made twenty-two post-mortems in one day, of course left records of only the most essential facts. The incidence of tuberculosis other than as a cause of death was routinely recorded by but five pathologists, who made any considerable number of autopsies. But as one goes through the 15,000 protocols which have been received in the Office of the Director of the Division of Laboratories and remembers the conditions under which most of the pathologists worked for a large prtion of the busiest time, one is struck with the high quality of the work from a large number of the officers, many of whom previously had very meager autopsy experience. The officers in charge of the analyses of these protocols say they are convinced the quality of the records will compare most favorably with any consecutive series

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of similar size from any civil hospital or hospitals in the United States. This is of course due in part to the relatively narrow limits of age, sex, time and disease variation.

Early in July the recording and cross-indexing of autopsy protocols was begun in the Office of the Director of the Division of Laboratories. Inadequate assistance rendered progress in this direction very slow, however. After the signing of the armistice, the release from duty elsewhere of a few competent pathologists made it possible to place the analyses of the autopsy protocols concerning a few diseases on a better basis. In order to facilitate the work in the Central Office and to obtain the benefit of the review by the competent pathologists scattered throughout the A. E. F., three office letters concerning respectively influenza and pneumonia, gunshot injuries, and war gas poisoning, were sent out to laboratory officers selected because of their ability and experience. These office letters gave forms for the analysis by the laboratory officer of all cases coming to autopsy under his individual observation. On the receipt of these analyses in the Office of the Director, they were compiled and coördinated with each other and with scattered protocols from other laboratories. Two other compilations are in progress, one on typhoid fever and another on tuberculosis. It is believed that all of these will be of immediate military value. In addition to these, however, the other autopsy protocols contain a great wealth of data for subsequent study, *e. g.*, of meningitis, dysenteries, cardio-vascular lesions, etc.

One field of post-mortem examinations which might have yielded invaluable results from the purely military standpoint was entered by but one pathologist in the A. E. F. This was the examination of the bodies of soldiers killed in battle. This service does not necessitate the making of autopsies but only a study of the site and character of immediately fatal injuries by competent medical officers with a good knowledge of anatomy and some appreciation of the character and effects of missiles. Where conditions will permit, a careful investigation of the battle dead in all of the different types of combat activity should yield information of inestimable value in both offensive and defensive warfare. The effectiveness or ineffectiveness of the many types of small arms missiles alone has been made the subject of but very little investigation with human targets under battle conditions. Until such a study can be made extensively and the observations collected and analyzed, the relative effectiveness of offensive warfare with small arms, hand grenades, shell fire, poison gases, etc., rests upon very incomplete and inaccurate observations and must remain largely a matter of conjecture. Similarly, without such studies, all attempts at the provision

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of armor which avoids, on the one hand, unnecessary weight and extent, and, on the other, penetrability, are proceeding without what would seem to be absolutely essential information of combat results. Such information could readily be obtained during battle activity by temporarily attaching competent medical officers to burial parties.

Plans for the Future.—In the future provision for clinico-pathologic work in laboratories in a military expeditionary force, there can be no question but that hospital and division laboratories of all types should be furnished with equipment and personnel for taking care of all clinico-pathologic work of the character indicated in the monthly report form, with the possible exception of dark field illumination apparatus for the study of venereal preparations. Whether, on the other hand, this type of work should cover the entire laboratory activities of any type of hospital in the next military expeditionary force is doubtful The laboratory officer must have enough daily experience to keep him trained for all emergencies which are apt to arise, and it is doubtful whether any hospital which is apt to keep patients more than two or three days should lack the facilities for cultural bacteriologic examinations. Certainly each hospital should have at least one medical officer capable of making an intelligent post-mortem examination.

In plans for the autopsy service in the future the general principle should be followed that, whenever men die after having been made the subject of diagnosis or treatment, their bodies should be examined post-mortem by competent pathologists. This policy of inspection of the services of the medical and surgical departments will furnish the greatest possible safeguard for the thoroughness and accuracy of their work. Of course such a policy presupposes a large number of well-trained pathologists, and there is no way for men to obtain such training except by more general autopsy examinations in civil hospitals. Provision should also be made for the better correlation of pathologic work with that of the clinical services both in civil practice and under military conditions. Only by the most perfect liaison between these services can the sick and wounded receive proper diagnosis and treatment.

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MALINGERING

By Dr. JOSEPH CATTON[1]
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THIS communication is given in the hope that it may stimulate medical officers, both those on active duty and those who, while they have returned to civilian life, nevertheless have been recommissioned in the Medical Reserve Corps—to take an account of their knowledge and opinions concerning fraud in disease. Two facts stand out plainly regarding this subject: (1) An understanding of malingering is essential because of its occurrence, in one of its forms, in the military, but also because of its occurrence in public hospitals, jails and in connection with industrial insurance; (2) there is a marked difference in opinion as to the frequency of malingering. Each medical officer must study the situation for himself and arrive at some sort of definite understanding as to what constitutes fraud in disease, its prevalence, its diagnosis, its significance, and the indicated action when it has been found.

DEFINITION

What is malingering? The word is derived from "malus," meaning bad, evil or base; and "aeger," signifying indisposition, sickness or illness. Also, it is related to the French "malingré," meaning sickly or ailing. The dictionaries tell one that it is the feigning of disease. Malingering is at once a form of imitation and of fraud, lying and deceit. When imitation begins to have an element of deceit, it becomes simulation; when simulation regards health, it becomes malingering. Likewise lying, deceit, fraud and feigning, when they are applied to matters of disease or disability, constitute malingering. Malingering includes fraud as regards the existence, etiology, symptomatology and severity of a disease or disability.

PREVALENCE

There is a great deal of disagreement as to the prevalence of malingering. Some observers think it is of common occurrence; others find it exceedingly rare. A third group, on more rational grounds, find that it does occur and try to recognize it. When one realizes what a drain the feigner or exaggerator of disease may be on government funds in the way of days lost to duty, compensation and the like, and, in civilian life, how the funds of insurance companies or private charities may in a manner be wrongly distributed, he hastens to detect fraud, and indeed has a bias towards its quick diagnosis. On the other hand, when he commences to

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study the literature on this subject, he hesitates to diagnose malingering lest he come in for one of the unpleasant expressions of opinion of the many men who are experts. Becker "deplores the too prevalent habit of seeing malingering everywhere." Charcot has said that the idea of malingering is too often based on the ignorance of the doctor;Oppenheim, that physicians who find malingering common lack thorough knowledge of mental disease, especially hysteria; Kuhn, that the greater the number of feigned lunatics seen by a physician, the less his psychiatric knowledge; Glebiewski, that it is the younger, less experienced doctor who sees malingering everywhere. Llewellyn and Jones find that the older physicians become, the less often do they find imaginary disease; and Strasser, that the greater a physician's experience, the less often he diagnoses simulation. So these experts are of the opinion that with understanding, and years, and experience, one sees less of malingering.

On the other hand, Pinton, an American, writes that malingering constitutes one of the most formidable evils. Crocq, a neurologist, Klar, a surgeon, and many of the eye men on the European continent believe in widespread pure simulation. Brouardell found a regular school at Montpelier for the training of malingerers.

However, the overwhelming majority of writers, including practically all the authorities, agree that out-and-out malingering in the mentally sound is exceeding rare.

The authority is equally strong, on the other hand, that the less frank forms of malingering—for example, exaggeration and prolongation of illness—are quite common, and especially so in those not normal mentally. The list of observers who are of this opinion is too long to quote and includes men in touch with institutional, industrial and civil medicine as well as military medicine. Official governmental reports, *e. g.*, Report of the Departmental Committee for Sickness Benefit Claims, England, comment at length on the prevalence of disease exaggeration and the like.

PRIVATE PRACTICE

Malingering is undoubtedly rare in private practice; isolated cases do, however, occur. The writer once witnessed an operation for uterine fibroid. During the procedure there was a hasty consultation, a Caesarian section was done, and a six-months foetus delivered. The surgeon had known the patient since girlhood. She had given him a carefully planned history which suggested pregnancy at no turn and which actually would negate such a diagnosis. This and an incomplete examination led to the diagnosis of uterine fibroid and the operation.

All sorts of fraudulent complaints may be advanced in an effort to have an abortion done.

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IN PRISONS—MILITARY AND CIVIL

The question of malingering often comes up among prisoners, both military and civilian. Here, again, cases of frank malingering in the mentally sound are a rarity. Penta found only 120 in four years' service in the Naples prison, and he considers this number high and explains that most of his patients came from the Camorra. Willmans in 277 mental prisoners found only two malingerers and later eliminated these two. Bonhoffer found only 0.5 per cent in 22 cases. Knecht, after seven and one-half years in the Waldheim Prison, found none. Vingtrimer's report is negative after examining 43,000 delinquents at Rouen. Glueck, director of the Psychiatric Clinic at Sing Sing, has yet to see a malingerer who was not also quite worthless mentally, and he says that the number of authorities is indeed small who do not look upon malingering itself as a morbid phenomenon. In the guardhouse or in prisons, fraud in disease is usually one more indication of the presence of the mental soil that gave rise to the criminal tendency. The writers quoted, in denying the occurrence of malingering, are referring to deliberate fraud in disease in the responsible mentally healthy person. Exaggeration and the like are common enough among prisoners; and simulation and dissimulation, too, but the latter are confined almost exclusively to the mentally diseased patients.

IN CONNECTION WITH INSURANCE, COMPENSATION, ETC.

The matter of fraud in disease in connection with insurance, especially industrial, and with compensation for illness or disability of any nature, is of great importance. A study of malingering in connection with industrial insurance may throw some light on fraud as related to compensation coming to soldiers and sailors under War Risk Insurance or pension laws. It has been the rule, following the introduction of industrial insurance in a country, to find reports of a great amount of malingering. In Germany, in the early nineties, Seeligmuller found 25 per cent, Shultzw 36 per cent and Hoffman 33 per cent of patients with traumatic neuroses to be malingerers. Medical journals were giving much space to the subject. The same prevalence of fraud was claimed later in France and then in England, under similar conditions. It should be noted, however, that as time went on the reports were of a different nature. For example, Oppenheim severely criticized the authors named above and reported the finding of only 4 per cent of neuroses following accident to be due to malingering. Steiner placed the percentage at 5 per cent and Hitzig at 3 per cent. The Corporation Hospital at Bonn placed the figure at 6 per cent in 1891, but only 2 per cent in 1894. German medical journals began to find malingering rare generally, as well as

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in the army. Boedecker of the German Insurance Office found simulation to play only a subsidiary rôle. Knapp's figure of 4 per cent in the same case types in America agrees with the later figures given above.

So, it is seen again that out-and-out malingering is rare. But, in connection with money compensation more than in any other place, the medical officer or the civilian physician is brought into touch with the less frank types of malingering; that is, with exaggeration, false imputation, etc. Collie found 8 per cent of 3,667 accident cases examined in nine years to be malingerers. In connection with his work for two large public bodies and fifteen to twenty insurance companies, he saw about 2,000 cases a year for some years and found 25 per cent fit to return to their work; and while the majority were not typical malingerers, they had unduly prolonged their illnesses. He found thousands of employes, who should have been at work, claiming sick pay. He found a very great number of working people "lingering at the threshold of return to work." He found a rapid increase in the number of non-fatal accidents, in the number of days of incompetency following accident, and in the number of complications following accidents in the industries, with the advent of the compensation laws.

IN THE MILITARY

This aspect of the subject is of particular interest, because at one time practically all the studies on malingering were made on soldiers, sailors and prisoners. Also, because the matter of compensation for soldier's diseases or disabilities acquired, or claimed to have been acquired, in the service, will be important for an indefinite period. And, again, an acquaintance with malingering is essential to the medical officer whether he is holding the sick call, is in the hospital ward or sitting on a disability board. Malingering in the military was written of the ancient Greek and Roman armies, in Napoleon's forces and in the more modern armies. The motives of fraud in disease in the Army and Navy are most numerous and will not be gone into in this communication.

Cheyne found the methods of malingering systematized and handed down from patient to patient in military hospitals. Gleboff found 2 per cent of native Siberian soldiers to be malingerers, and the percentage ran as high as 50 per cent in the gipsy populations. Marie found 9 out of 40 French soldiers examined were "conscious shammers or at least conscious exaggerators." Sicard found malingering always implanted on some actual condition, but the malingering itself conscious; 9 cases were detected in 17 cases studied for over three months.

There were numerous isolated reports of cases of malingering early in the war, but the observers mentioned and a few others make up the small total of those who have written of seeing much malingering in

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the present conflict. Bailey found 1 per cent the maximum for the United States home forces during 1917, and this referred to the percentage among drafted troops. The writings of Shumkoff, Westphal and Hübner, Schwab, Sigg, Chavigny, Dejerine, Grosset, Regis, Charpentier, Roussey and Boisseau, Campbell and Clarke, which together represent observations in the Russian, German, French and British armies, point to a distinct rarity of malingering in the great war. Before reaching any conclusion, however, regarding the prevalence of the major and minor forms of malingering, there should be a careful study of the records of the office of the chief surgeon of the army concerned. The records of desertion, of "absent without leave" and other forms of absenteeism should be considered, together with the organization sick-report books, sick leaves, sick furloughs and discharges on certificates of disability. Col. E. L. Munson, of the Regular Medical Corps, U. S. Army, made a study of this nature of the records of the Civil War and to a less extent of the Spanish War. He notes that not a single instance of malingering is reported in the medical history of the Civil War in connection with the almost inconceivable number of 6,454,834 admissions to sick report; neither did the reports of the Surgeon General show a single case of malingering among 317,195 admissions during the Spanish War. He finds, however, that almost unbelievable numbers of soldiers were absent from duty during the Civil War, and that the number increased as time went on, until in round numbers about 300,000 men were absent, and only 600,000 on duty in the Union Forces in 1865! After deducting one-tenth of this total (which is about the proportion of deserters), the remainder were absent mainly because of matters concerning disease or disability. And, when the actually sick and wounded are deducted, the enormous number remaining are found to have been helped to their homes by lack of care of medical officers at sick report, sick furloughs, poor hospital organization, the attempted use of civilian physicians for military patients, discharges for disability and the like.

The German Army reported only 43 malingerers in the period 1894–1908. The French Army in thirty-seven years had only 308 cases. It would seem, as Munson says in effect, that all countries are inclined to paint the glorious side of their histories rather than the disagreeable side, which includes such things as the prevalence of malingering, especially in its minor forms. Munson's picture of the "Malingerer's Progress," from initial sick report to his home and relief from duty, is interesting, illuminating, and food for most serious thought. The picture would not be so dark as regards our forces in the present war, but, nevertheless, it should be painted.

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The personal observations reported in this paper were made: (*a*) On recruits and Regular Army men in camps in this country; (*b*) on patients in Base Hospital No. 64, A. E. F., during hostilities; and (*c*) on convalescents in hospitals of the Riviera Group during the six months following the armistice. It would seem that the 1 per cent figure of Pearce Bailey would tell the story of Camp Fremont and Camp Sevier during duty there. It was not the experience of the Classification Board at Base Hospital No. 64, during hostilities, that it was the rule for men to want to get back to the front. Once they were classified "A" (ready for full combatant service), there was a change in attitude and a desire to get moving forward, etc.; not so, however, while there remained a chance of going the other way. Before this board there were evidences of simulation, but mostly of exaggeration. The patient, to be sure, had almost invariably entered with some real complaint, but in a great number of instances, where some form of malingering was present, new and unrelated complaints might be added. Medical officers were at times, perhaps unthinkingly, parties to the prolongation of hospitalization; it was not infrequent for an officer to furnish a verbal or written list of soldiers who were good workers or the like and "who should be retained as Class B men for a little longer;" and this during active hostilities!

In the convalescent area, after hostilities had ceased, there was a great amount of disease pretension on top of existing conditions, and very much exaggeration and prolongation of illness. The soldier's desire to stay on the Mediterranean because of climate, the luxury in which he was kept by the United States, and perhaps new and female friends, was a great factor in determining the nature and number of complaints and would sometimes play a greater rôle than the actual pathology present. As an example, certain patients would present themselves again and again, claiming a bronchitis, where repeated examinations showed no physical signs or temperature, and as they saw hope disappearing, would say, "Oh, doctor, can't you make it a week or two more?" or something to that effect. One officer patient, because of the absence of further findings to go with his regular and formerly just complaints, sought a written opinion from another department (ear, nose, and throat) to the effect that he had disability there.

Another factor that helped to determine the color and intensity of complaints was the desire to get home, and this increased each day after the armistice. In the period September to December, 1918, not a single officer was sent to the United States from Base Hospital "A" because of disability; in fact no case of discharge of a medical officer because of disability, among the some 125 officers of the hospital center of

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which this hospital was a part, came to the notice of the writer. On the contrary, in Base Hospital "B," which arrived after the armistice, 9 medical officers of the staff were returned to the United States because of disability; and four more approached members of the Classification Board with that in mind. The cases returned to the U. S. follow:

Case F. Hyperthyroidism.
Case G. Pyelitis.
Case H. Phlebitis.
Case I. Observation for tuberculosis.
Case J. Cholecystitis chronic; recurrent.
Case K. Hemorrhoids.
Case L. Stricture of rectum; cause undetermined.
Case M. Otitis media, chronic.
Case N. Abscesses, dental; multiple.

The cases who approached board members and discussed return to the United States follow:

Case O. Neurasthenia; excessive use of hypnotics.
Case P. Psoriasis.
Case Q. Tachycardia, persistent.
Case R. Nervousness; worry.

It does not seem reasonable that the difference in records of Base Hospitals "A" and "B" in the matter under discussion is just a "happen-so." A few of the officers were genuinely ill in sufficient degree to warrant return to the United States. In others it is the opinion of the writer, and it seems to have been the opinion of other medical officers including certain of the board members, that there was great exaggeration of complaints. If some of these officers were in the distress claimed, they must have dissimulated to get into the service. True, the latter is looked upon by some as a laudable act; but there are possible relations to compensation in which the new environment, the United States Army, might come to carry more than its share of troubles based on old pathology! It is not implied that in any of the cases cited was this angle of the matter for a moment thought of; but, in consideration of dissimulation in the abstract, this relation to compensation is a most important one. Some patients used dissimulation to get back to their organizations. The reasons for the latter were varied; some thought the chances of reaching the United States by this route better than by the disability one; others desired to leave the service as Class "A" men no matter what their real condition; others were in line for promotion or desired to remain in the service. A case of dissimulation follows.

Case S.—A major, Regular Medical Corps, presented himself for classification as a convalescent from bronchitis and gave no other complaints. Examinations and subsequently elicited history showed an aortic aneurism and probable gastric ulcer.

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He admitted his knowledge of the presence of the former and the probability of the latter, but urged insistently that they be overlooked. He was marked Class C, under observation for aortic aneurism and gastric ulcer.

Two cases of deliberate fraud will be cited:

Case T.—Recruit of draft age in a base hospital unit requested relief from that organization in order that he might accompany his mother on a relief mission to Roumania. Authority refused him. He came to the office of the writer, complaining of severe and persistent back pains and of being nervous. He had but recently passed the entrance physical examination for the Army. There was nothing remarkable in the history excepting that he had his tonsils removed six months before. No pathology was found. The X-ray and orthopedic examinations of back were negative. Department surgeon's office informed him the only way out was to report for active duty and go on sick call, which he did. The general medical and orthopedic examinations being negative, he was sent to the neuropsychiatric wards of Letterman Hospital. At this juncture his mother was threatening the future of the base hospital and the writer if her son were not released from the Army. No disease was found at the Letterman, and before many days the internement and contact with neurotic patients palled on this patient and he reported himself well and was discharged. He was seen a few days later with a smile on his face, and gave the information that he was now happy in his new work, that his complaints had not been genuine and that he was glad he was through with that "nut" house. This patient confessed to malingering. It should be mentioned that his mother has a paranoaic personality.

Case U.—Private in base hospital. Complained of repeated attacks of sour stomach, nausea and vomiting. No definite diagnosis could be made. He was classified "D" in Beaune, France, and successively at reclassification centers in France, and in America, and finally arrived at San Francisco, Cal., his home, where he became well and was discharged. He came to the office of the writer, told of his discharge and stated that he had had nothing whatsoever the matter with him, but had taken repeated doses of ipecac to bring on his symptoms; that none of the "medicos" could tell what was the matter, nor did any of them "get wise." To complicate the case, in going over some old office records it was found that this man had been a patient before his entrance into the Army and had had certain gastro-intestinal complaints the cause of which had not been determined. He is somewhat of a boaster and liar. He may have some real organic or functional derangement of his stomach, and this may have determined the place on which to center his fraud. Just how much real and how much induced symptomology he had in France is not known.

Cases of exaggeration of disease were too numerous to mention.

DIAGNOSIS

It is impossible to include in a communication of this sort, in addition to the data already given, a discussion in detail of the differential diagnosis of malingering. However, the attempt will be made to point out the steps to be taken when fraud in disease is suspected. A medical officer should first of all consider the responsibility of such a diagnosis, and he should determine to eliminate bias, in so far as he is able, during the investigation. He should take a thorough history and make com-

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plete and systematic examinations. In addition to the ordinary examinations, indirect, periodic, or constant observation may be used, or possibly observation by a nurse or trained and reliable corps man.

FIRST RULE OUT ORGANIC DISEASE

First of all, organic disease must be eliminated. It can be differentiated from malingering and functional conditions taken together. There must be an organic basis for optic neuritis, optic atrophy, nystagmus, unequal pupils, Argyl-Robertson pupil, reflex pupillary immobility, persistent hemianopsia, Babinski, Oppenheim or Strumpell signs, persistent and marked ankle clonus, incontinence of urine or feces, true bed sores, paralysis of single muscles or a group of muscles supplied by a single nerve, reaction of degeneration in muscle or nerve.

The complaints in organic disease are not necessarily disabling; those of malingering and functional conditions tend to be so.

While the syndromes of organic disease tend to be typical, fairly constant, may be progressive, usually showing remissions and exacerbations; and being somewhat responsive to treatment (and they follow anatomic and physiologic bases), those of malingering and functional disease tend to be atypical of organic syndromes, to vary from time to time, and to be without anatomic or physiologic basis as regards distribution, etc.

The patient with organic disease usually wants to get well, helps with his treatment, seems sincere, and has no tendency to simulate; if exaggeration be present, it is slight, and its amount depends on the personality of the individual; his statements are honest; he will not accept suggested symptoms, and he has no particular anxiety to impress; his history and findings correspond pretty well. The hysteric or malingerer may show a lack of desire to get well or may even resist treatment; he seems insincere, tends to simulate and to exaggerate and has a "defective health conscience"; his statements are unreliable; an impossible symptom may be added to complaints on suggestion; there is a desire to impress and usually a discrepancy between complaints and findings.

Sensory disturbances in functional and feigned disease may include the mucosae; they do not follow anatomy; the areas vary from time to time; they may be sharply defined at the mid-line (the latter more characteristically in hysteria). Organic sensory changes usually do not involve the mucosae; they occur in segmental, root and peripheral nerve areas; the areas tend to remain constant excepting as influenced by treatment or the progress of the disease; there is no sharp delineation at the mid-line.

The pain of the hysteric or malingerer usually has no accompaniments excepting the making of faces, wiggling, etc. Organic pain is usually

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accompanied by general restlessness and may give rise to changes in the pulse rate (especially increase), changes in blood pressure (especially rise), characteristic feces, flushing or pallor of the face, or dilatation of the pupils. Real pain, over a long period of time, leads to loss of sleep, appetite and weight, and soon there come emaciation and marked disturbance in well being. Feigned or functional pain and a good appetite and normal weight may be seen together.

In an organic injury causing amnesia, the events just before and just after the accident are usually forgotten; in functional disease and feigning there may be remembrance of these events. Feigned and functional contractures disappear under an anesthetic; organic contractures do not. An organic tremor usually has specific accompaniments, *e. g.*, the speech changes, optic atrophy and nystagmus of multiple sclerosis; these are not present with the non-organic tremor, but the latter may have joined with it, tachycardia or dyspnea.

NOW RULE OUT HYSTERIA

If the examiner now feels that he has ruled out organic disease, he may proceed to determine whether or not there is a real functional condition present. Hysteria offers the most difficulty. Neither hysteria nor malingering has an organic basis, and there is deception in both. The hysteric believes his lesion true; he deceives and believes himself; he does not try consciously to deceive others; his actions are without apparent motive. The malingerer knows his lesion to be false; he does not deceive himself; he tries, consciously, to deceive others; he always has a motive. If the patient shows constricted visual fields, globus, hysterical fits and hystero-genetic zones, the diagnosis of fraud should certainly not be made. Again, the following are not believed capable of simulation: oliguea or anurea, unilateral sweating and salivation.

The hysteric tends to look a little odd mentally, a little frightened, to have widened eye-slits, to be irritable, fidgety and loquacious. He gives bizarre explanations of the nature and intensity of his complaints. He likes acting, examinations, hospitals, and treatment.

The malingerer, regardless of the "front" he may put on, may be found on study to be sullen, suspicious, disturbed. He tries to assure one of his good faith, talks more slowly, and with calculation. He dislikes examination, hospitals and treatment.

The hysteric, having no conscious motive, plan, or design, may show more inconsistencies than the malingerer, who has all three. For the same reason the hysteric's story may be more definite than the malingerer's.

The sensory disturbances of fraud may be anywhere; in hysteria the midline definition and glove-like type are characteristic.

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The malingerer's pain is more diffuse, vague, non-localized, severe, unremitting and resistant to treatment; the hysteric may respond readily to mental or moral suasion.

And so one may go on weighing the differences, and he may call to his aid any of the hundreds of special tests for the detection of fraud; or he may use suggestion, surprise, ruses, ridicule, irony or satire, or appeal to honor, or invoke shame or fear; he may distract attention, mislead, or cause bewilderment or confusion, and as a result feel he has ruled out hysteria and diagnoses malingering. But to make the diagnosis he must either have the confession of the patient or be able to demonstrate objectively the bases of his conclusions.

SIGNIFICANCE

Having eliminated organic disease and hysteria and decided that malingering is present, what is its significance? True, it should determine the discontinuance of hospitalization, relief from duty or of aid or compensation; the latter should only be forthcoming for real organic or functional disease. But is the patient culpable? Should he be punished? Before answering this question, one more consideration is in order. The non-expert opinions of medical officers, although based on thorough and repeated examinations, cannot be final as regards the basic psychology in a given case and the responsibility of a given individual for his acts. Therefore the suspected malingerer must always be given a psychiatric examination. The result of the latter will demonstrate whether he is one of the number of supposedly mentally normal individuals who have simulated or exaggerated disease because they are underfed, overworked, or lack education, especially moral education as regards responsibility and the like; or whether he has a psychoneurosis, especially hysteria, traumatic neurosis, or pathomimia; psychosis, *e. g.*, traumatic psychosis; inebriety, especially alcoholism or morphinism; mental deficiency, especially including morons and borderline conditions; or constitutional psychopathy, especially pathological lying or criminalism.

SUMMARY

(*a*) While out-and-out malingering is exceedingly rare, the minor forms are rather widespread in occurrence and should be looked for carefully in order that fraud may not be a drain on the efficiency of the military organization or upon the funds to be expended for hospitalization or upon the compensation to be distributed as pensions or in consequence of the War Risk Insurance act. Secondly, in order that the patient himself may be benefitted by such treatment as is indicated for the mental disturbance that may be found at the bottom of his complaints.

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(*b*) The diagnosis of frank malingering should not be made until the following four questions shall have been answered in the afirmative:

1. Is organic disease absent? Although all apparent signs of previous injury are absent, can it be said that there is no unapparent aftermath?

2. Is hysteria absent?

3. Has the patient confessed to feigning, or can the proof of fraud be objectively demonstrated?

4. Does psychiatric examination show absence of psychoneuroses, psychoses, inebriety, mental deficiency and constitutional psychopathy?

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EDITORIAL

THE TWENTY-SEVENTH ANNUAL MEETING

The twenty-seventh annual meeting of the Association was held in St. Louis on the 13th, 14th and 15th of October and was of interest in many ways.

The proceedings of the meeting appear in the pages of this issue and are therefore the subject of only passing comment in this section.

The debated coalition between the Association and the Medical Veterans of the World War was discussed by members of the Executive Council of our Association and of the Board of Trustees of that society, but no steps taken by either body toward a merger.

The amendment to the Constitution of the Association which was offered is worthy of careful consideration by the members of the Association, who will have to decide at the next meeting as to its accpetance or rejection. This amendment makes eligible to membership some who, under the present constitution, are not qualified for membership, and, in addition, enlarges the eligibility for active membership.

At present, "ex-medical officers" are qualified for election only to associate membership, in which category they can neither vote nor hold office.

The proposed amendment grants this franchise and eligibility to office. Speaking as a member of the Association, this seems logical and just to us. Under our present law, while a man must hold a commission to be eligible for active membership, the vacation of his commission does not displace him as an active member. He is eligible today for continuous active membership whether he thereafter resign or be discharged. Tomorrow, having been discharged, or having resigned, his only entry is as an Associate Member.

The amendment corrects this and makes it possible that any of the "ex-medical officers" may hold office. This seems both desirable and proper when we consider the number who fall, and will fall, in this classification. Personally, we hope that this may be accomplished. We do not comment on the clause enlarging the eligibility to membership, for there are both *pros* and *cons* to this, and it seems to us a matter for individual consideration and decision by the voting membership.

The discussion of the papers read was gratifying and interesting and altogether of much benefit. We stated it as our opinion in an editorial in the September issue that this very materially enhanced the value of a paper.

The registered attendance at the meeting was between seventy-five

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and one hundred. Not what it should be for an association as numerically strong as ours. Of course, for most of us this is a time of retrenchment, and it is easy to understand that the acute bogey—the H. C. of L.—prevented the attendance of many who might have been present otherwise. In this connection it seems opportune to call attention to the date and place of the next meeting, New Orleans, the Thursday, Friday and Saturday prior to the meeting of the American Medical Association. Heretofore some of our members have had to choose between attending one of these meetings. Next April, with the time and place set as it is, we hope and believe that there will be a large increase in attendance at the meeting of our Association since both this and the A. M. A. may be covered in the one trip.

It should be so, for our Association is certainly of increased importance since the world war and is widening in its scope and influence. We have many distinguished names on our roster, and addresses by them merit a full and appreciative audience. Therefore we urge that just as many as possible make their arrangements to go to New Orleans next April and make the Twenty-Eighth Annual Meeting a notable one in the history of our Association. Think it over, every one of you, Regular Services, Reserve, National Guard, "ex-medical officers"—every one who merges his particular identity for the time being at least into that of membership in the Association of Military Surgeons.

JAMES ROBB CHURCH.

THE MEDICAL DEPARTMENT RECRUITING CAMPAIGN

Upon the resumption of general recruiting for the Army February 28, 1919, the Adjutant General's Office was confronted with an unusual situation. All branches of the service were in dire need of men not only to replace regularly enlisted men whose term of service had expired, but also to fill the ranks of a greatly enlarged regular army. Strenuous efforts were made in demobilization camps to secure enlistments of emergency men. The results accomplished far exceeded those obtained by the general recruiting service. The several staff corps were called upon to conduct campaigns for personnel and all organizations were authorized to recruit for themselves.

The Medical Department recruiting campaign began July 1, 1919. At that time the Department had secured about 3500 men. Today it has 11,000 enlistments. Such great success has crowned these new activities, that the Surgeon General's Office anticipates that it will be able to discharge all emergency enlisted men on or prior to December 31, 1919. This measure will require about 4500 additional enlistments for assignment principally to general hospitals where the great majority

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of drafted men are now stationed. Nearly all camps and departmental posts and stations have progressed so far in replacements that no concern is felt in their direction, although their work is by no means finished. By strenuous and enthusiastic recruiting, it is anticipated that the Department will be able to solve its pressing replacement problem by the end of the calendar year.

It is with satisfaction that the Journal comments on the present recruiting campaign. At first it was considered rather a hopeless task. Instead of meeting with failure or meagre results, the Department leads all branches of the service in recruiting except the Motor Transport Corps. Its success is attributed to the enthusiastic response in these activities by all Medical Officers throughout the service.

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ASSOCIATION NOTES

Certificates for the following members are held in this office for correct address. These certificates have been sent out to the various addresses and returned. If anyone having the proper address of any of the members of the Association published in this list will kindly forward same to the secretary, it will be appreciated:

Capt. Wm. H. Axtell, M. C., U. S. A.
1st Lieut. Charles C. Ayres, M. R. C., U. S. A.
1st Lieut. Walter J. Baker, M. C., U. S. A.
1st Lieut. Robert E. Baldwin, M. R. C., U. S. A.
1st Lieut. J. Warren Bauman, M. R. C., U. S. A.
1st Lieut. Jesse J. Beatty, M. C., U. S. A.
1st Lieut. Leonard P. Bell, M. R. C., U. S. A.
Capt. J. L. Bendell, M. C., U. S. A.
1st Lieut. Harold A. Benson, M. C., U. S. A.
1st Lieut. Thomas B. Bond, M. C., U. S. A.
1st Lieut. Henry B. Boyden, M. C., U. S. A.
1st Lieut. Geo. B. Brach, M. R. C., U. S. A.
1st Lieut. Edward B. Brannin, M. C., U. S. A.
1st Lieut. Ed. Lane Brinson, M. C., U. S. A.
1st Lieut. A. L. Brown, M. R. C., U. S. A.
1st Lieut. Charles A. Brownson, M. C., U. S. A.
1st Lieut. John J. Carden, M. R. C., U. S. A.
Capt. Thomas L. Carrington, M. C., U. S. A.
1st Lieut. W. E. Chamberlain, M. C., U. S. A.
Capt. Harry X. Cline, M. R. C., U. S. A.
1st Lieut. James A. Connell, M. C., U. S. A.
1st Lieut. Grover C. Conyers, M. C., U. S. A.
1st Lieut. William C. Cotton, M. C., U. S. A.
Capt. C. D. Cowles, Jr., M. C., U. S. A.
1st Lieut. William L. Crawford, M. C., U. S. A.
1st Lieut. Claude W. Cummings, M. R. C., U. S. A.
1st Lieut. Alfred Daudelin, M. C., U. S. A.
1st Lieut. Arthur C. Dorn, M. R. C., U. S. A.
1st Lieut. L. Dumont, M. C., U. S. A.
1st Lieut. Frank C. Farmer, M. R. C., U. S. A.
Lieut. David Ferguson, Jr., M. C., U. S. N.
1st Lieut. Luther J. Ferguson, M. R. C., U. S. A.
1st Lieut. James M. Fetter, M. C., Iowa N. G.
1st Lieut. Homer J. Flinn, M. R. C., U. S. A.
1st Lieut. Woodruff J. Flowers, M. C., U. S. A.
Lieut. Frank M. Gaetineau, M. C., U. S. N. R. F.
1st Lieut. Wm. V. Gale, M. C., N. J. N. G.
1st Lieut. Cleow J. Gentzkow, M. R. C., U. S. A.
1st Lieut. Wm. C. Gibson, M. C., U. S. A.
Capt. John U. Giesy, M. R. C., U. S. A.
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COMMENT AND CRITICISM

STATISTICS IN REGARD TO VENEREAL DISEASE

WAR DEPARTMENT OFFICE OF THE SURGEON GENERAL

WASHINGTON, *October* 15, 1919.

THE EDITOR,
MILITARY SURGEON,
Washington, D. C.

DEAR SIR:

This office is so frequently requested to furnish statistics in regard to venereal diseases before and during the world war that it constitutes something of a burden even to reply that such statistics are not yet available as relating to the world war and that, owing to reduction of clerical help in the War Department, no promise can be made that they will be available at an early date, that they will be published when available and that, because of the same shortage of clerical help, it is impossible to give much attention to individual requests of the sort.

For these reasons I request that publicity be given to the following figures which I have obtained from various sources and which I believe to be correct, and it will then be possible to refer inquirers to your valuable publication:

Concerning the incidence of venereal disease in general, we now have more information in regard to its prevalence in civil life than we ever had before, this information having been gained from the examination of men drafted for service in the army. These men were nearly all between the ages of twenty-one and thirty-one, the ages of greatest prevalence of venereal disease.

Among the first million men, 2.88 per cent were found affected with venereal disease when they arrived at camps of mobilization; among the second million, 5.8 per cent. These discrepancies in percentages found in the first and second million may probably be accounted for by the facts that among the first million men examined syphilis was a cause for rejection by local boards, and many men with venereal disease were not sent to camps, and that the statistics in regard to the first million men are not so complete as in regard to the second million, as in the former

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instance only the major military defect was noted, whereas in work for the second million two defects, if present in one man, were noted.

When the second draft came, men who had been rejected at the time of the first draft because of venereal disease were included, so that the proportion of venereal disease found among the second million men appears unduly high. I believe that the average of 4.32 per cent is probably a fair estimate of the proportion of men between the ages of twenty-one and thirty-one who were sent to camps under the draft law and who had venereal disease.

The Army had, in 1917, 73,762 cases of venereal disease in a mean strength of 678,579 men; in 1918, 227,861 in a mean strength of 2,518,499 men. From January 1, 1919, to September 9, 1919, there had been reported in the United States 25,782 cases in a mean strength of 448,949 men; and in the A. E. F., 35,756 cases in a mean strength of 1,002,933. It should be stated that the A. E. F. rate embraced only men excused from duty on account of venereal disease. The number of individual men in the army between January 1, 1917, and November 11, 1918, was 4,185,220; therefore the total infections reported, including those brought in with the draft, equalled 8.6 per cent.

The venereal incidence rate, that is, the number of new cases resulting among 1,000 men of the army in the course of the year, was for the period of 1899 to

1904	149.92	1911	163.49
1905	178.72	1912	136.70
1906	158.91	1913	97.22
1907	167.82	1914	110.69
1908	174.84	1915	107.71
1909	177.46	1916	103.35
1910	155.51	1917	113.82

The reported incidence of venereal disease from the camps in the United States during the war with Germany averaged about 60. In the A. E. F. it averaged about 45. It is my personal opinion that the United States records contained a good many duplications and that the rate was probably about the same in the United States as in France, that is, about one-third of what it had been twenty years previously. The accomplishment of keeping the rate equally low in France was very remarkable. The venereal sick records above quoted rather corroborate this.

P. M. Ashburn,
Colonel, Medical Corps, U. S. A.

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A CORRECTION

CONCORD, MASS.,
October 25, 1919.

COL. J. R. CHURCH,
The "Military Surgeon,"
Washington, D. C.

MY DEAR COLONEL CHURCH:

The October number of the MILITARY SURGEON has reached me, and I have been reading among other things the review of Fishberg's "Pulmonary Tuberculosis" written by me which appears in that number. It is perfectly correct and satisfactory with one exception, which annoys me so much that I have decided to call your attention to it. The punctuation of a portion of the first sentence is so fantastic as to entirely destroy the sense. Beginning near the end of the second line, it now reads: "although clinically apparent, tuberculosis has for the most part alone been considered a cause for the rejection of the individuals concerned and tuberculin has not been applied for diagnostic purposes at all; the fear felt," etc. That is to say: tuberculosis has been the sole cause for rejection, notwithstanding the fact that it was clinically apparent, which is quite meaningless. The passage should read: "although clinically apparent tuberculosis has for the most part alone been considered a cause for the rejection of the individuals concerned and (although) tuberculin has not been applied for diagnostic purposes at all, the fear felt," etc. The idea here, of course, is that no harm has resulted from not permitting the exclusion of men on fine-drawn, fancy diagnoses of suspected, incipient or latent tuberculosis and the like. The sentence, as I wrote it, is a somewhat abbreviated paraphrase of Dr. Fishberg's statement. I am solely responsible for the wording, but that fact is not apparent to the reader, who may think it that of the author and hold him responsible for the muddled sentence. I have a high opinion of Dr. Fishberg and of his work and perhaps, you will think, may be taking this matter too seriously on that account, but I have thought it best to bring it up and ask you to make a correction, if you can see your way clear to do so.

Very sincerely yours,

G. E. BUSHNELL.

HICKEY VIBRATOR

Due to the fact that we have received through the mails numerous inquiries as to the distribution of the Hickey vibrator, we publish the following reply from Surgeon Hickey, in answer to our inquiry as to where this apparatus is on sale.

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WESTERN UNION TELEGRAM
[*Copy.*]

1919 Oct. 24, AM 1:29

EDITOR MILITARY SURGEON,
Washington, D. C.

Owing to war conditions have had difficulty in having instruments manufactured in quantities that could be sold at reasonable prices. Arrangements made for manufacturers and distribution early date. When ready to be placed on sale announcement will be submitted for advertising columns MILITARY SURGEON. Those now being placed on market readily disposed of locally and in orient where there seems to be considerable demand.

(Signed) J. P. HICKEY,
United States Immigrant Hospital,
Angel Island, Cal.

THE SAMUEL D. GROSS PRIZE

Essays will be received in competition for the Samuel D. Gross prize of $1,500 until January 1, 1920.

The conditions annexed by the testator are that the prize "shall be awarded every five years to the writer of the best original essay, not exceeding one hundred and fifty printed pages, octavo, in length, illustrative of some subject in Surgical Pathology or Surgical Practice, founded upon original investigations, the candidates for the prize to be American citizens."

It is expressly stipulated that the competitor who receives the prize shall publish his essay in book form, and that he shall deposit one copy of the work in the Samuel D. Gross Library of the Philadelphia Academy of Surgery, and that on the title page it shall be stated that to the essay was awarded the Samuel D. Gross Prize of the Philadelphia Academy of Surgery.

The essays, which must be written by a single author in the English language, should be sent to the "Trustees of the Samuel D. Gross Prize of the Philadelphia Academy of Surgery, care of the College of Physicians, 19 S. 22d St., Philadelphia," on or before January 1, 1920.

Each essay must be typewritten, distinguished by a motto, and accompanied by a sealed envelope bearing the same motto, containing the name and address of the writer. No envelope will be opened except that which accompanies the successful essay.

The committee will return the unsuccessful essays if reclaimed by their respective writers, or their agents, within one year.

The committee reserves the right to make no award if the essays submitted are not considered worthy of the prize.

WILLIAM J. TAYLOR, M.D.,
JOHN H. JOPSON, M.D.,
EDWARD B. HODGE, M.D.,
Trustees.

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A VOICE FROM AFAR

"THE MILITARY SURGEON"

The June (1919) number of THE MILITARY SURGEON, in addition to much matter of scientific interest to the medical profession, contains an appeal to American medical practitioners who have served in the Army of the United States to join the Association of Military Surgeons of the United States as they pass back into civil practice. This Association provides its members with the means of keeping in touch with their sometime comrades on active service, preserves their interest in military medicine, and is a bond of loyalty and patriotism. Those who served in the Army Medical Corps of the American Army, have returned with the feeling that they have lived. They maintain that they would not have missed their experience for anything on earth. The Association of Military Surgeons and its official organ, THE MILITARY SURGEON will assist in securing for its members the fullest advantages of war experience. We hope to bring to the notice of our readers from time to time some of the messages conveyed through THE MILITARY SURGEON.—*The Medical Journal of Australia.*

AN APPEAL FOR HUMAN EMBRYOLOGICAL MATERIAL

In 1906 I observed certain malformations of the human shoulder-blade, and in contributions to current literature I have given them the collective name, "the scaphoid type of scapula," and pointed out some of its hereditary, clinical and anatomical significance.

Probably the most important observation connected with this type of scapula in man is its age incidence, that is to say, it occurs with great frequency among the young and with relative infrequency among the old. There appear to be two possible explanations of this fact, either (*a*) One form of shoulder-blade changes into the other during development and growth, or (*b*) many of the possessors of the scaphoid type of scapula are the poorly adaptable, the peculiarly vulnerable, the unduly disease susceptible—the inherently weakened of the race.

I have attempted to answer these questions by seeking evidence in various directions, and one of the most important of these has been a study of intrauterine development of shoulder-blades. My investigations in this direction have been limited by the material at my disposal, which has been inadequate for a definite solution of this phase of the problem. I am, therefore, appealing to physicians for fetuses in any and all stages of human development.

It is desired that the material, as soon as possible after delivery, be

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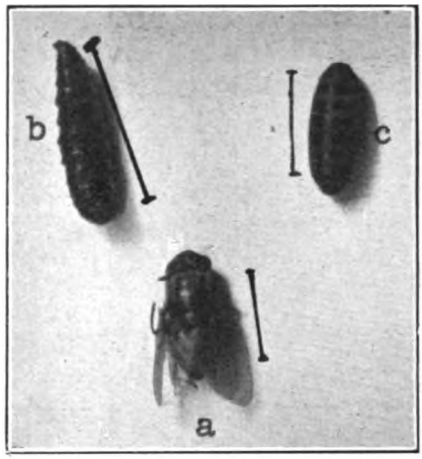

(*a*) Chrysomyia macellaria—the central black stripe does not show well in the print.

(*b*) Larva.

(*c*) Pupa.

NOTE: The dark color of the larva is due to the preservative.

(To face page 729.)

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immersed in 10 per cent formalin in a sealed container and forwarded to my address; charges collect. Due acknowledgment will be made to those forwarding material.

WILLIAM GRAVES,
St. Louis.

REARING THE SCREW-WORM FLY

IN PRESENTING this paper, I wish to state that it was prompted by the large number of physicians whom I have met who were not familiar with that phase of entomology which deals with the life cycles of the diptera. I know of a number of attempts to rear the fly from the larva in cases of myiasis and the results were all negative, due to the physician trying to complete the life cycle on carrion.

The patient from whom the following larvae were obtained, was first seen on August 22, 1914 (by Dr. L. P. Earnshaw). He complained of epistaxis, frontal headache and exhaustion. He stated that he had had attacks of nose bleed at various times. Physical examination showed edema of the lower eyelids, redness and swelling of the nasal mucus membrane on the left side, with a bloody discharge. The next day the epistaxis continued, and the discharge had a very disagreeable odor; the edema of the lower lids was aggravated and their color was purple. About one o'clock in the afternoon he became unconscious. The epistaxis ceased until the morning of the twenty-fourth; it was at this time that the larvae were noticed.

The larvae were present in great numbers and came from the nose and mouth. Examination of the mouth showed large numbers of them crawling from the throat, to which place they had migrated from the nasal cavity. They were a very light pink, almost white in color, 19 mm. in length, with blunt anal end tapering to the head; had 12 segments, each with circles of minute spines, and the head was a metallic green. One hundred and fifty of these larvae were collected and put in a jar containing a piece of raw beef. The jar was covered with mosquito netting to keep other flies off.

On August 26 the collected larvae were placed in a screened box containing moist earth and horse manure in one part, and moist earth, alone, in the other, meeting in the center of the box; there was no partition between the two. The depth of this was 75 mm. The larvae immediately burrowed into all parts of the contents of the box, showing no predilection. The box was then placed in a shed with no windows to limit the evaporation of the moisture from the contents.

Some of the pupae were removed from the box on August 31. They were 12 mm. in length and had a dark brown shell. The rings were

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more sharply defined than in the larvae, the number of rings corresponding to the number of segments in the larvae.

The first flies appeared on the sixth of September, and on the seventh there were about seventy-five of them in the box. These flies averaged 1 cm. in length, had a russet head, an irridescent metallic green thorax and abdomen, and three longitudinal black stripes on the dorsal surface of the thorax. They were classified as the "Chrysomyia macellaria."

These flies were reared under adverse conditions due to cool weather. This probably delayed their propagation somewhat.

I wish to thank Dr. L. P. Earnshaw, late of the Western Branch, National Home for Disabled Volunteer Soldiers, whose patient this was, for supplying me with the medical history of the case and the larvae.

FREDERICK W. SHAW, M. D.

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Obituary

ALLEN DAVIS ASHBURN

Allen Davis Ashburn, son of Colonel and Mrs. Percy M. Ashburn, Medical Corps, died at Stamford, Conn., November 24, as a result of an automobile accident.

He was born July 20, 1898, at Fort Thomas, Kentucky. One of his early schools was at Baguio, P. I., where he received scholarship honors. He entered Groton School in 1913, graduating *cum laude* in 1917. Besides being president of his class all of the time he was at Groton, in his sixth form year he was senior prefect of the school, the highest honor obtainable. He was active in basketball, football and baseball, having been captain of the baseball team the year it obtained the state championship. He was editor-in-chief of the school magazine and leader of one of the debating teams. In the Students' Council he was a member, and president of the Athletic Association.

He entered Yale in 1917 and had already received scholastic honors when in February, 1918, he enlisted and went to France, first as a private and then as a sergeant of the 324th Field Artillery. After his arrival in France he was sent to the Artillery School at Saumur and graduated after the signing of the armistice. He saw service in Germany with the Army of Occupation and returned home a commissioned officer. He reëntered Yale after returning from France and was a junior at the time of his death. He was a member of the D K E Society and one of the most liked and respected men in the college.

Col. Thomas Q. Ashburn, Field Artillery, and Lieut. Col. John C. Ashburn, Infantry, are uncles of the deceased.

Burial will be at Batavia, Ohio, the family home.

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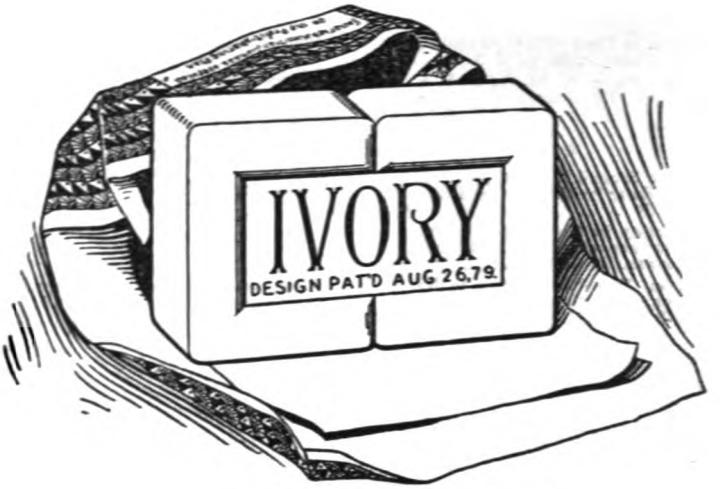

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